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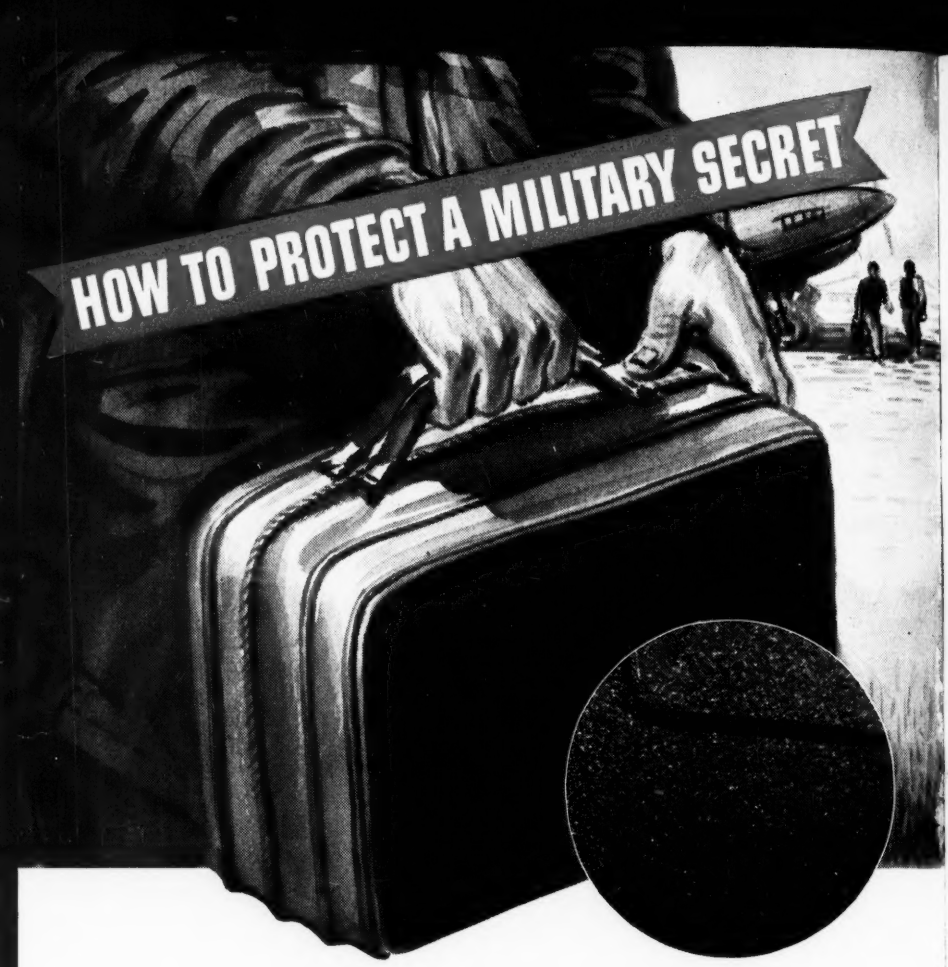

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Today the man or woman with a job is given every chance to learn all there is to know about that job and every other job that is even remotely connected with it. In an incredibly short period the average employee is in a position to know all the answers. The more interest he takes in his surroundings, the more competent he becomes, until before long the profundity of his knowledge amazes him.

Regardless of what the score is, the fellow who gets along today is the fellow who discovers how to do things, then goes ahead and does them. Only a fool does the same thing day after day without ever wondering why he does it and making some effort to find out.

And it is so easy to find out today. He who stays in a rut in these times has only himself to blame.

One may select practically any job in the finishing field—or any other field—as an example. It may be that a new man is hired to work behind a spray gun, squirting white lacquer on a machine the like of which he never saw before. If he has his wits about him, he'll know what the machine does and why it has to be sprayed with white lacquer before two days have passed. Then he'll look up lacquer in a dictionary and find out how it differs from other paints. His interest will not lag there, because every answer brings up a number of additional questions, the answers to which are available for the asking. In short, he will rapidly absorb so much information that it will become uneconomical to keep him behind the spray gun.

"Wish they'd'a put him in front of it," mutter the envious. But they who envy are fools, for the chances were equal. Our new employee has won his first promotion, which need be but the beginning of a long series of promotions. Promotion is there for the man who can take it.

A fundamental axiom of education has always been this: that we learn to do by doing. When shall we ever have a better chance to apply this great truth than now?

OCTOBER, 1944 Vol. 9, No. 1

Finishing Operations at Willow Run

By BRYANT W. POCOCK

IT is no secret that at peak production the word Willow Run Bomber Plant turned out B-24 Liberator bombers at the rate of approximately one an hour. The technical considerations attending an achievement of this magnitude are so complex as to stagger the average imagination, and not the least of these problems are concerned with the finishing of metal parts.

The entire story cannot yet be told, but certain features of the finishing operations at Willow Run which can be disclosed at this time will be of unusual interest to the trade.

Figure 1 shows an elevated tier of several tanks where aluminum parts are given a special surface preparation to ensure excellent spot welds. This treatment consists essentially of a sulfuric-chromic dip. The parts are first cleaned in a solution of mild alkaline salts of the following specifications:

3 1/3 oz./gal. sodium metasilicate
2/3 oz./gal. borax
1/8 to 1/4 oz./gal. Nacconol NR
Temp.: 200-210 deg. F.
Time: 3-5 min.
Still tank.

Nacconol NR is the brand name for a proprietary alkyl aryl sodium sulfonate detergent possessing high wet-

Fig. 1—On a raised platform beside a spot-welding department in the Willow Run plant, aluminum parts are given special surface preparation baths to ensure excellent spot welds. The tanks shown comprise three units of baths, each unit consisting of an alkaline cleaner tank and a running cold water rinse.

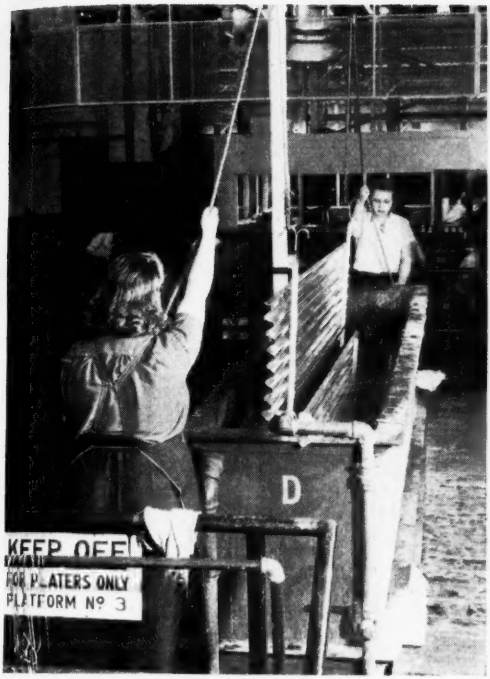

Fig. 2—A bomb bay door section is hoisted from a combination dip and spray rinse tank by two workers in one phase of the special surface preparation bath for aluminum parts prior to spot welding.

ting and dispersing properties. Cleaning is followed by a cold water rinse, after which the parts are immersed for the same length of time in the sulfric-chromic bath. The latter is contained in lead-lined still tanks, steam heated to a temperature of 180 to 185 deg. F., and has the following ingredients:

1 gal. H_2SO_4 (sp. gr. 1.84)
3.5 lb. CrO_3
Water to make 10 gal. solution

After a second cold water rinse the parts are dried in a circulating hot air drier.

The above treatment has been found excellent for removing anodized coatings, acting to replace the original oxide with a surface which lends itself better for spot-welding operations. Such a surface is also more versatile. The treatment has been found applicable to any of the common aluminum alloys, such as 24ST dural, 24ST alclad, 61ST, 52SO,

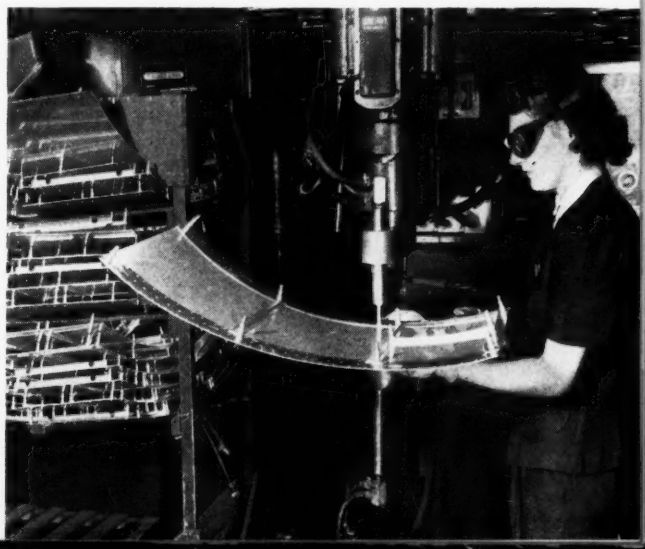

Fig. 3—In this illustration, an operator is shown spot welding two pieces of metal after passing through special surface preparation baths. The pieces are held together under pressure and bonded by an electric current passing through the metals.

Fig. 4 — Reassembling aluminum parts for the Liberator bomber prior to spot welding are three women workers. Aluminum parts for each complete sub-assembly to be spot welded are placed on a single wire hook and passed through a special surface preparation bath as a unit. After being washed, the parts are taken from the wire hook and assembled by means of tension fasteners. They are then ready to be spot welded.

•

and so on. Willow Run chemists have conducted considerable research on proprietary cleaners and the known technical acids, bases and salts, and have lost faith in the measurement of surface resistance as a criterion of the quality of a cleaner. Results at Willow Run indicated that 24ST dural specimens had approximately the same surface resistance in the case of several cleaners differing markedly in efficiency of operation.

Figure 2 shows a bomb bay door section being hoisted from a combination dip and spray rinse in one phase of the above treatment. Ten years ago, according to Ford scientists, people thought that all they had to do was remove grease and oil prior to welding, not realizing the role played by Al_2O_3. Prompted by war emergency, however, and the necessity for volume production, most aircraft companies today make use of

Fig. 5—Air intake and exhaust ducts, which help the Ford-built Liberator "breathe" in flight, are made in half sections and gas welded together. On the raised platform in the background are the combination passivating and flux removing baths through which each gas welded aluminum part passes to be washed and cleaned before going on to the next assembly operation.

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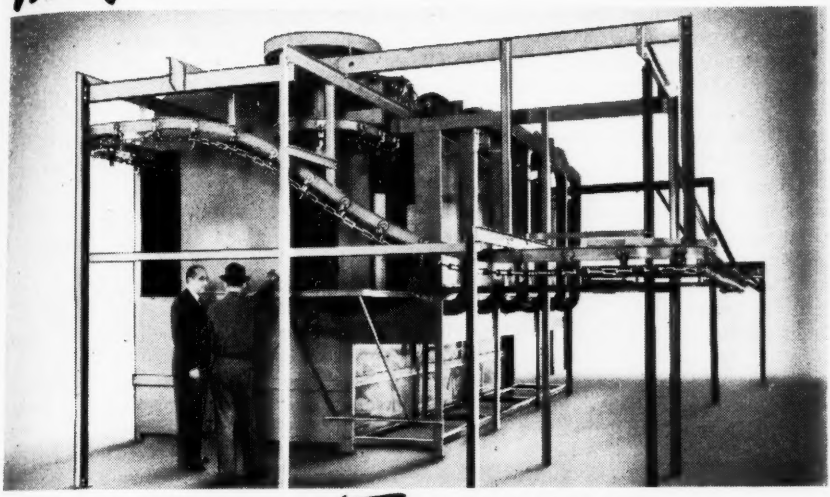

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some method of specialized cleaning, which has for its fundamental purpose the removal of aluminum oxide. Aluminum can be welded without this removal, but mass production could never be attained because of electrolytic pickup and the resulting resetting of machines, to say nothing of the frequency of welds not meeting rigid specifications due to impurities, cracks, cavities, porosities, metal expulsion, sheet separation, excessive heating, and so on.

About 75 per cent of all trouble experienced in the spot welding of aluminum can be traced to unsatisfactory surface preparation. Another function of the above treatment consists in preventing the formation of finely divided copper smut during the etching process. The lead tank lining does not deposit on the metal being cleaned. The Willow Run laboratory proved that alclad can be etched in the above solution for 15 minutes without detecting any loss under the microscope, indicating that sacrificial loss of aluminum is negligible.

Racking material used for this assembly consists of 18-8 stainless steel, and is not attacked by the solution. The parts are dissembled and strung together on large stainless steel safety pins. Parts may consist, for example, of various gauges which are subsequently welded together to form completed assemblies of different alloys. Regardless of thin or thick gauges or of the alloy being cleaned, the time is the same in all cases. A good example of a typical case would be alclad sheet welded to 61S framework that had been heat treated and artificially aged.

The life of the above solution is unusually long. Insufficient rinsing can be detected by the reduced chrome, which is green, thus lending itself to visual inspection. Analytical control is quite simple, routine analysis being for total chrome, reduced chrome and alumina. Analysis is followed by indicated addi-

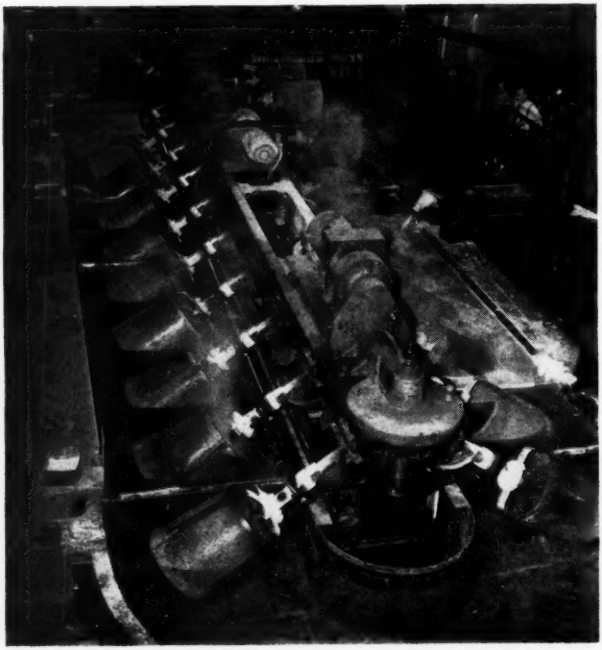

Fig. 6—Conforming closely to plating machines now in operation, this special machine alroks several million rivets each day for Ford-built Liberator bombers. Poured into baskets at one end, the rivets make a complete circuit of the machine in which the baskets are dipped and raised again according to the immersion period required for each successive tank.

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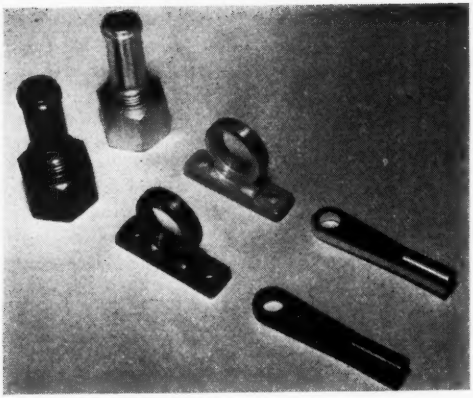

Fig. 7—The aluminum parts in the rear row have been cleaned and are ready to be alroked. The dark samples in the foreground indicate appearance of parts after alroking.

tions about once a day, depending on the volume of parts going through on the basis of two shifts per day.

Figure 3 shows a part being spot welded, an operation which has been estimated to save over 100 man-hours on each bomber. The operation is essentially the bonding together of two pieces by the heat of an electric current. Figure 4 shows aluminum parts after surface preparation being reassembled for spot welding.

The air intake and exhaust ducts of the B-24 are gas welded. Figure 5 illustrates the arrangement of combined passivating and flux removing baths for treatment of these parts

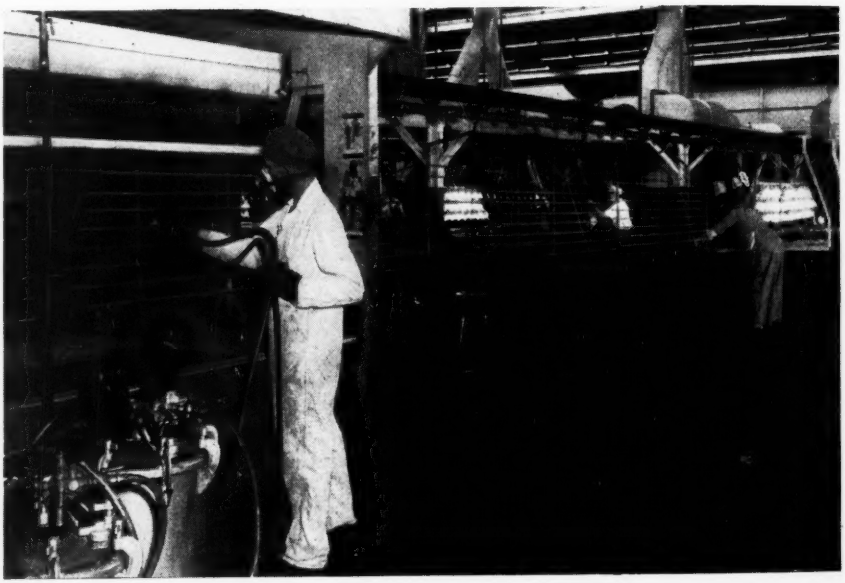

Fig. 8—Illustrated here are a few of the paint shop conveyor lines that carry painted parts from spray booths through infra-red drying ovens to succeeding paint booths. All faying and scarfing surfaces, as well as exposed surfaces inside the bomber, are painted. The two workers in the right background can be seen turning parts coming out of the drying ovens after being painted on one side. In the foreground, a worker is shown completing the painting operation.

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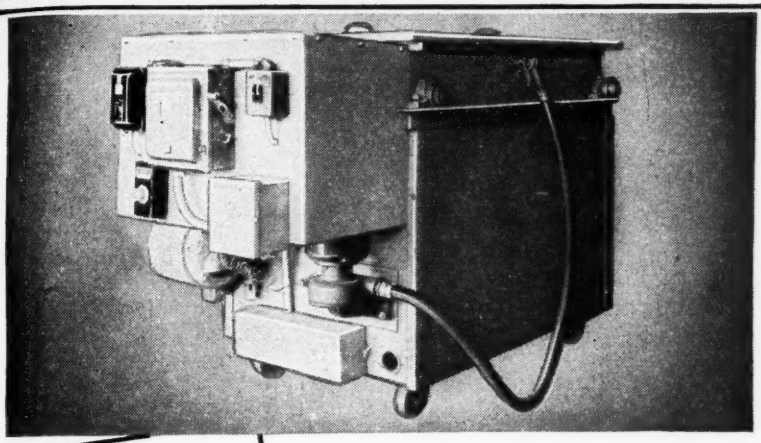
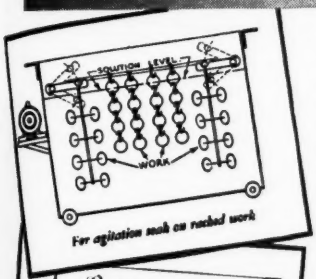
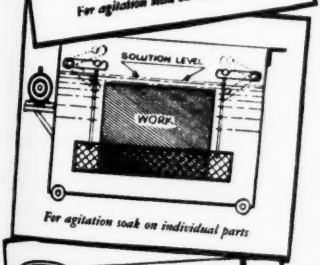
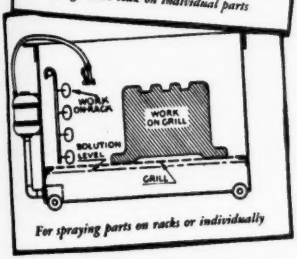




For agitation soak on racked work



For agitation soak on individual parts



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CLEANERS·METHODS·MACHINES

Fig. 9—Shown here is a view in one of the laboratories at Willow Run where solutions to many perplexing production problems incidental to the building of Ford Liberator bombers have been found.

after gas welding. To neutralize the flux, the parts are immersed for 5 minutes in hot water, which softens and removes it, any trapped flux being removed in a 5 to 10-minute subsequent dip in nitric acid at 150 deg. F. This is followed by cold and hot water rinses, drying and inspection.

Relatively little cadmium plating is done at Willow Run, and is confined to those parts subsequently exposed to a marine atmosphere. The conventional plating bath is used. Zinc plating, using the conventional acid bath formulas, is followed by a dichromate dip. A microscropically thin oxide of zinc takes on some of the dichromate, which is passive, or inert, thus increasing the corrosion resisting properties of the plate.

Small aluminum parts for the B-24, especially rivets, are finished at Willow Run by the alrok process, which is a patented treatment licensed by the Aluminum Company of America. U. S. Army Specification 98-20007 Amendment No. 3 approves alrok coatings as comprising an adequate treatment prior to painting. Alrok 12 is recommended for wrought alloys and alrok 712 for cast alloys. Other alrok products are especially designed for definite purposes, such as No. 14 for 3S, 52S, alcad 24S or alcad 3S gasoline tanks, No. 714 for parts with small internal passages, and so on.

It has been found at Willow Run that any proprietary cleaner used prior to the alrok treatment must be free from silicates, as these give rise to an insoluble film which partially protects the surface from the alrok. Uniformity of surface, not selective or partial coating, is desired. The uninhibited type of cleaner reacts with the aluminum to liberate hydrogen gas, which produces a mechanical cleaning effect on particles of dirt which may be imbedded in pores on the surface of the aluminum. The high temperature used in the Ford cleaning process is believed to expand the metal, increasing the size of such pores.

Parts to be alroked are immersed 1 to 5 minutes at 200 to 210 deg. F. in a cleaner containing 3 oz./gal. TSP (trisodium phosphate or Na_3PO_4), 3 oz./gal. sodium carbonate, and ⅛ to ¼ oz./gal. Nacconol NR. This is followed by a running cold water rinse, after which the parts are etched 3 to 5 minutes at 180 to 185 deg. F. in an acid dip made up

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of 1 gal. H_2SO_4 (sp. gr. 1.84), 3½ lb. CrO_3 and water to make 10 gallons solution. The etch has for one of its functions the removal of heat treat oxides and their substitution by oxides more suitable for alrok.

Alrok has been found at the Ford plant to produce very satisfactory coatings, which compare favorably with finishes resulting from chromic acid electrolytes, as far as paint adhesion and corrosion resistance are concerned. The coating is adherent and will not rub off. Resistance to abrasion is not as high as in the case of the alumilite process using sulfuric acid. Its advantage over anodizing is said to lie in the fact that the barrel plating technique can be used, and that there is no applied E. M. F. It is highly adaptable to volume production, and no re-runs are encountered at the bomber plant.

Figure 6 shows a view of the automatic assembly used at Willow Run for alroking. This machine has a capacity of several million rivets per day. Figure 7 illustrates the appearance of parts before and after alroking.

A recent army order to stop painting the outside of the B-24 bomber has resulted in a saving of approximately 80 lb. in the total weight of the ship. This was made possible by using alclad, the metal "plywood." Alclad containes an inner core of heat-treated aluminum alloy which uses copper as the hardening constituent. This core is sandwiched between two layers of high (99.7 per cent) purity aluminum. The latter, being anodic to the core, protects the core by galvanic action.

Certain parts on the inside of the ship, especially where two dissimilar metals are in contact or in close proximity, are still being painted. Parts subjected to considerable exposure are protected by coatings of aluminum paint over a zinc chromate

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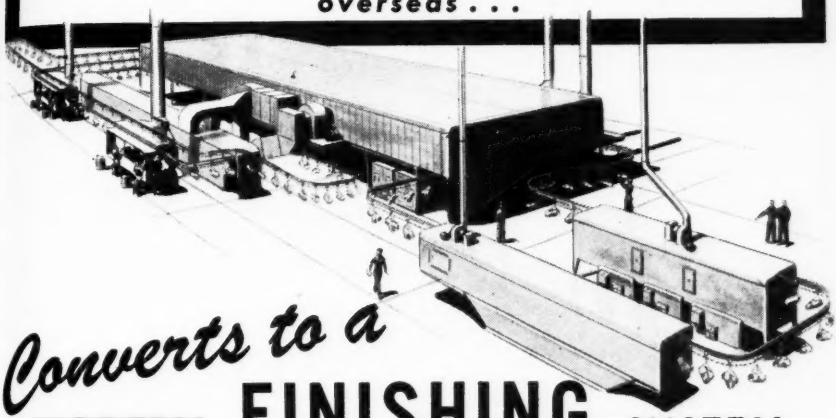

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primer. Figure 8 shows a paint booth and conveyor lines which carry parts from the booth through infra-red drying ovens to succeeding paint booths. Prior to painting, a cleaning operation, which is under conveyor system control, is used. A proprietary alkaline cleaner containing silicate inhibitors is sprayed on the parts hot, removing ink stampings and light oils which are the residue from previous operations such as stamping, milling, machining, drilling, and so on. An infra-red drier follows the cleaning.

One of the interesting phases of finishing at Willow Run concerns the manufacture of decalcomanias. Decals are made from blueprints or finished black and white drawings. The latter are photographed to the original size of the blueprint, from which a negative is made and converted to a positive transparency. A contact print is then made on carbon tissue, with contact by vacuum and a three-minute exposure. This carbon print is placed in cold water to soften the emulsion, and is then placed face down on an aluminum plate. The latter is immersed in water at 120 deg. F. and the paper backing soaked off, the plate being agitated to facilitate the process. Development is in clear water by suitable chemicals.

The developed emulsion is transferred to a silk screen, imbedded into the latter and dried, and the screen is used for printing the decal. Coatings of paints are forced through the screen, which acts as a stencil, by a rubber squeegee, as in the following example:

1. Synthex, a clear enamel which promotes adhesion.
2. A clear glossy lacquer.
3. A white glossy lacquer.
4. A second white glossy lacquer.
5. A clear flat lacquer.
6. A red flat lacquer.

There are 485 decals on each B-24 bomber, and the screens are filed away and used over and over again. New screens are made as above whenever the old screens become defective.

Figure 9 shows a view in one of the laboratories at Willow Run. As in most large war plants, the laboratory is used for control of all technical processes and development work. As rapidly as short cuts are worked out and tested in the laboratory they are put into practice in the production lines. Already solutions to many metal and metal-finishing problems have been found by members of the laboratory staff, and it is felt at Willow Run that "the lab" is one of the most important and valuable departments in the plant.

Enamel Biblography and Abstracts. Compiled by E. H. McClelland, technical librarian, Carnegie Library of Pittsburgh, and edited and published by The American Ceramic Society, Inc., 2525 N. High St., Columbus 2, Ohio, this 352-page cloth-bound comprises an unusually comprehensive review of the literature of the porcelain enameling industry which has been published from 1928 to 1939 inclusive. At the rear of the book are subject and co-author indexes.

Copy of "Enamel Bibliography and Abstracts" is available at a price of $5.00.

"Flint-Tred." Printed in two colors, a four-page folder which provides complete instructions for the application of "Flint-Tred"—a concrete floor hardener and dustproofer—is now being issued by the Rock-Tred Corp., 629 W. Washington Blvd., Chicago 6, Ill. Copy free upon request.

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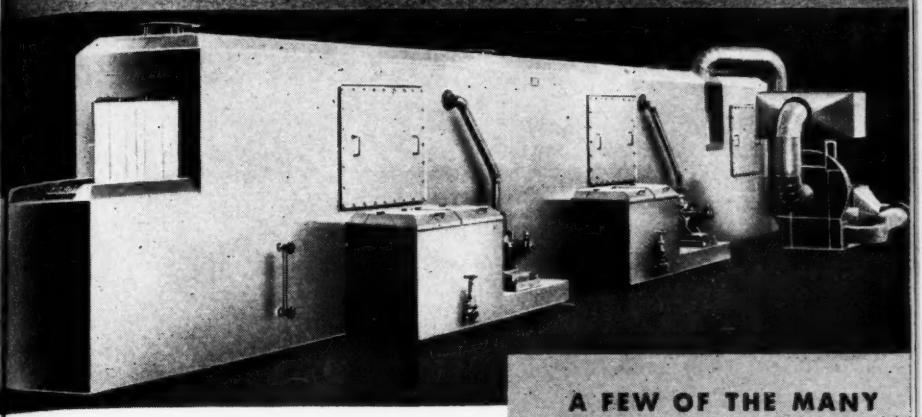

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Petroleum Thinners and Their Significance to Metal Finishing

By JEFFREY R. STEWART

THE importance of petroleum thinners to the metal finishing industry has not, until recently, been fully realized either by the producers or consumers of paints, enamels, and lacquers. One of the psychological reasons for this is the fact that the petroleum thinner does not contribute to the ultimate film-forming characteristics of the protective coating, but merely evaporates into the atmosphere. A short-sighted technologist or a spray mechanic, therefore, would be inclined to consider such products as a necessary evil. Such, however, is not the case, as the writer will attempt to demonstrate in this article.

The reader should understand that the other type of thinners or solvents, namely, the coal tar solvents such as toluene, xylene, and solvent naphtha, which are also of great importance, will not be discussed in this article but will be the topic for a separate article to appear in a subsequent issue of PRODUCTS FINISHING.

In the first place, we must establish the meaning of the various hydrocarbon fractions which are considered as petroleum hydrocarbons. In general, it can be considered that the following is a list of the various petroleum fractions, some of which are of interest to us.

1. Petrolic ether
2. Benzine (not benzene)
3. Gasoline
4. V. M. & P. naphtha
5. Lacquer diluent
6. Mineral spirits.
7. Kerosene (sometimes incorrectly called "coal-oil")

Of these seven fractions, only three are used to any considerable extent in the paint and metal finishing industry. These are V. M. & P. naphtha, lacquer diluent, and mineral spirits. Kerosene is only used to a very limited extent, due to its slow evaporation rate. The first three on the above list cannot be used extensively due to the very fast rate of evaporation and the low flash point which brings them into the category of a fire hazard.

V. M. & P. naphtha is the official abbreviation for Varnish Makers and Painter's naphtha. It is a straight-run form of mineral spirits, usually boiling within a range lying above 200 deg. F. and below 320 deg. F. It possesses an evaporation rate simi-

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PHYSICAL PROPERTIES OF VARIOUS PETROLEUM PRODUCTS

Name of Petroleum Product	Specific Gravity @ 60 deg. F.	Flash Point	Distillation Range	Weight per Gallon in Pounds	Refractive Index
Petrolic Ether	0.630 to 0.670	below 0° F.	104° to 158° F.	5.46	1.3650 to 1.3760
Benzine (not benzene)	0.730 to 0.750	below 0° F.	176° to 266° F.	6.16	1.4070 to 1.4250
Gasoline	0.660 to 0.680	60° to 120° F.	140° to 248° F.	5.58	1.3750 to 1.3877
V. M. & P. Naphtha	0.750 to 0.770	20° to 50° F.	212° to 320° F.	6.33	1.4090 to 1.4110
Lacquer Diluent	0.731 to 0.733	below 40° F.	194° to 275° F.	6.10	1.4071 to 1.4256
Mineral Spirits	0.770 to 0.800	86° to 105° F.	302° to 410° F.	6.54	1.4190 to 1.4210
Keroene	0.810 to 0.820	105° F.	392° to 518° F.	6.79	1.4510 to 1.4510

NOTE: The above values do not represent any specific product, but are averages of most of the commercial products on the market. Since most petroleum products are not definite chemical compounds, but are complex mixture of organic compounds, it is possible that any new or specific product may not fall within the above limits.

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lar to, or somewhat faster than 10 deg. xylene. It is sometimes considered as being the fraction which stands between gasoline and mineral spirits. Since the solvent power of V. M. & P. naphtha is rather low, it is sometimes fortified by the addition of stronger solvents such as some of the coal-tar hydrocarbons, turpentine, or any other high solvency material. Due to the evaporation rate, which is comparatively rapid, it is used in dipping and spraying enamels and paints.

The next petroleum fraction which should be considered is "lacquer diluent." By noting the accompanying graphic chart, it will be observed that this is really a more highly refined form or a closer fraction of V. M. & P. naphtha. It also possesses a distillation range which is only slightly higher than benzine. Broadly speaking, a lacquer diluent is any volatile liquid which may or may not be a solvent for the non-volatile portion of a potective coating. Most diluents, however, actually are not real solvents, but may be used in conjunction with other active solvents. Lacquer diluents are used primarily to reduce the cost of lacquers. They are also sometimes used in order to minimize the lifting tendency of enamels or lacquers which are applied over primers, surfaces or undercoats.

Mineral spirits is the most important and widely used of all the petroleum thinners. (In England, and several other foreign countries, the term "white spirit" is used.) In America, there is a small movement under way in petroleum circles to assign a new term to this fraction by calling it "petroleum spirits." Such a term, it is felt, would be much more appropriate, since the material is obtained from crude petroleum and not from a mineral as the name would indicate.

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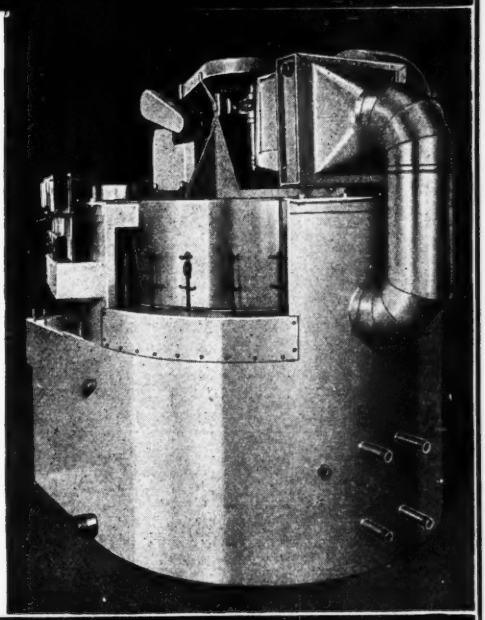

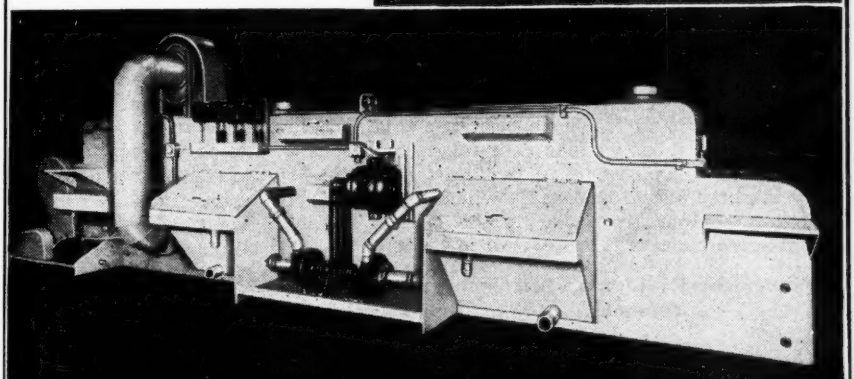

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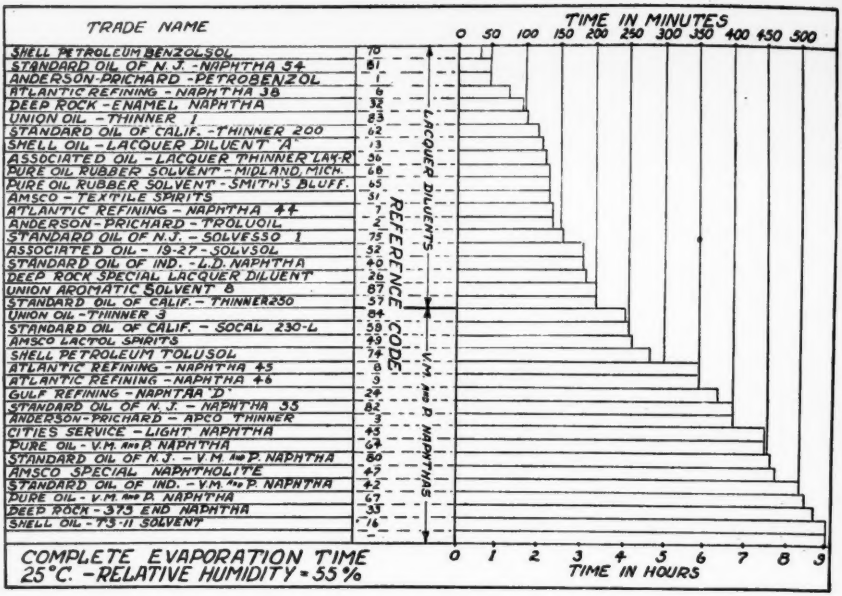
TRADE NAME
TIME IN MINUTES
0 50 100 150 200 250 300 350 400 450 500
SHELL PETROLEUM BENZOLSOL 70
STANDARD OIL OF N.J. - NAPHTHA 54 81
ANDERSON-PRICHARD - PETROBENZOL 1
ATLANTIC REFINING - NAPHTHA 38 6
DEEP ROCK - ENAMEL NAPHTHA 32
UNION OIL - THINNER 1 83
STANDARD OIL OF CALIF. - THINNER 200 62
SHELL OIL - LACQUER DILUENT 'A' 13
ASSOCIATED OIL - LACQUER THINNER LAK-R 36
PURE OIL RUBBER SOLVENT - MIDLAND, MICH. 68
PURE OIL RUBBER SOLVENT - SMITH'S BLUFF. 65
AMSCO - TEXTILE SPIRITS 31
ATLANTIC REFINING - NAPHTHA 44 7
ANDERSON-PRICHARD - TROLUOIL 2
STANDARD OIL OF N.J. - SOLVESSO 1 75
ASSOCIATED OIL - 19-27 - SOLVSOL 52
STANDARD OIL OF IND. - L.D. NAPHTHA 40
DEEP ROCK SPECIAL LACQUER DILUENT 26
UNION AROMATIC SOLVENT B 87
STANDARD OIL OF CALIF. - THINNER 250 57
UNION OIL - THINNER 3 84
STANDARD OIL OF CALIF. - SOCAL 230-L 59
AMSCO LACTOL SPIRITS 49
SHELL PETROLEUM TOLUSOL 74
ATLANTIC REFINING - NAPHTHA 43 8
ATLANTIC REFINING - NAPHTHA 46 9
GULF REFINING - NAPHTHA 'D' 24
STANDARD OIL OF N.J. - NAPHTHA 35 82
ANDERSON-PRICHARD - APCO THINNER 3
CITIES SERVICE - LIGHT NAPHTHA 45
PURE OIL - V.M. AND P. NAPHTHA 64
STANDARD OIL OF N.J. - V.M. AND P. NAPHTHA 80
AMSCO SPECIAL NAPHTHOLITE 47
STANDARD OIL OF IND. - V.M. AND P. NAPHTHA 42
PURE OIL - V.M. AND P. NAPHTHA 67
DEEP ROCK - 375 END NAPHTHA 33
SHELL OIL - 75-11 SOLVENT 76
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0 1 2 3 4 5 6 7 8 9
TIME IN HOURS

In this chart are shown many of the outstanding petroleum thinners which are used in the American paint industry. By viewing this chart, it is possible to get a quick "bird's eye view" of the comparative evaporation rate.

The original term, although not very sceintific, is still commonly employed, and therefore will be adopted in this article for the sake of convenience.

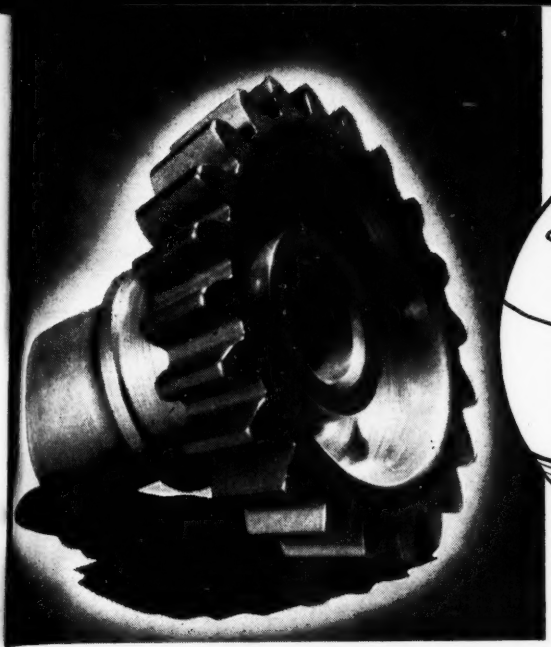
As originally manufactured, mineral spirits was fractionated in an effort to match the evaporation rate of turpentine. Now, however, we have various grades and fractions of mineral spirits to meet various demands. Most mineral spirits have a flash point slightly over 100 deg. F. which makes it comparatively safe from a fire standpoint.

Methods for Evaluating Petroleum Thinners

In the examination and evaluation procedure, the tests which are most frequently conducted are:

1. Distillation range
2. Flash point
3. Specific gravity
4. Acidity
5. Evaporation rate
6. Color
7. Aromatic content (aromaticity)
8. Solvent power (solvency)

There will be little need to explain most of these tests in this article, because most of them are fully explained in the various laboratory handbooks. The only exception is the last test—the solvent power determination. This is sometimes referred to as the "solvency." Unfortunately, many of the books and specifications do not give a very clear idea regarding the importance and significance of this test. Much has been done by the Paint and Varnish Production Clubs, the various petroleum refiners, and some governmental agencies. However, the information is rather scattered and there has been a great deal of duplication of efforts. Many



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disputes have arisen because there has been no central bureau or clearing house to coordinate the information. To counteract this undesirable condition, it is interesting to note that an independent organization is now assembling data and information from all reliable sources. This will be coordinated and tabulated in booklet form. It will be a non-profit venture in an effort to get all the producers and consumers of metal finishes to agree on a standard method of determining solvent power.

There are at least five different methods for measuring the solvent power of a petroleum thinner. Of these, the kauri-butanol determination is the most popular, and has recently been adopted by the U. S. Army.

Here again, some confusion exists because not all laboratories follow the some procedure or adhere closely to the instructions It is felt, therefore, that PRODUCTS FINISHING will be contributing their share of cooperation by printing the standard and tentative method of making this test. This method, although tentative in its present form, will probably be adopted with little or no changes when adopted in the final form. The correct procedure for making this determination is as follows, and, incidentally, is the method used by a large majority of paint manufacturers and petroleum refiners.

The Correct Method for Determining Solvent Power

It is first necessary to accumulate all the apparatus and the reagent used in the determination. These are as follows:

1. Analytical balance.
2. Ehrlenmeyer flask or idodine flask, 200 ml. capacity.
3. Thermometer, range 20 to 30 deg. C.
4. Burette with glass-stoppered stopcock, capacity 50 ml.
5. Weighing bottle with g ass stopper.
6. Curved pipette or medicine dropper, capacity 2 ml.
7. Sheet of white paper imprinted with 10 point century type, light face, upper and lower case. The same as sample shown herewith.

> The purchaser of industrial petroleum naphthas often uses the terms "sweet" and "sour" as an adjective to describe a certain petroleum fraction. These terms are not only used frequently but are also used loosely, in many cases in an inappropriate manner. The correct usage of these words are are follows: When a naphtha turns sour, it usually means that the disulfides have been reduced to mercaptans. On the other hand, a sweet naphtha is one which has been subjected to the reaction which transforms the mercaptans (by treatment with a doctor solution and the addition of elementary sulfur) to form lead sulfide and organic disulfides.

This is a sample of the official type used in the turbidity test. The accuracy of the solvent power determination depends considerably on the use of such an imprinted piece of paper in order to determine the exact end point in the titration.

All of the first six items can be found in practically any small laboratory. If any of the material is not on hand, it may be obtained from any of the laboratory supply houses. Under the present restrictions of the War Production Board, the only device which will be difficult to obtain is the analytical balance. The last

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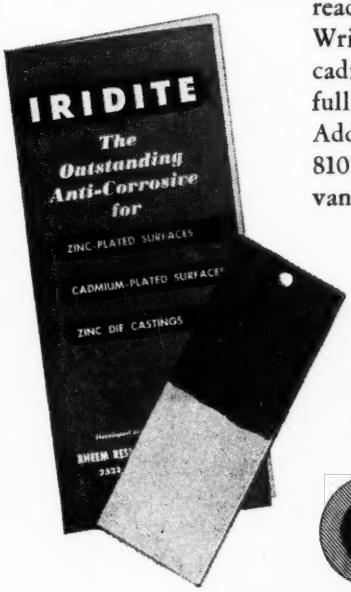

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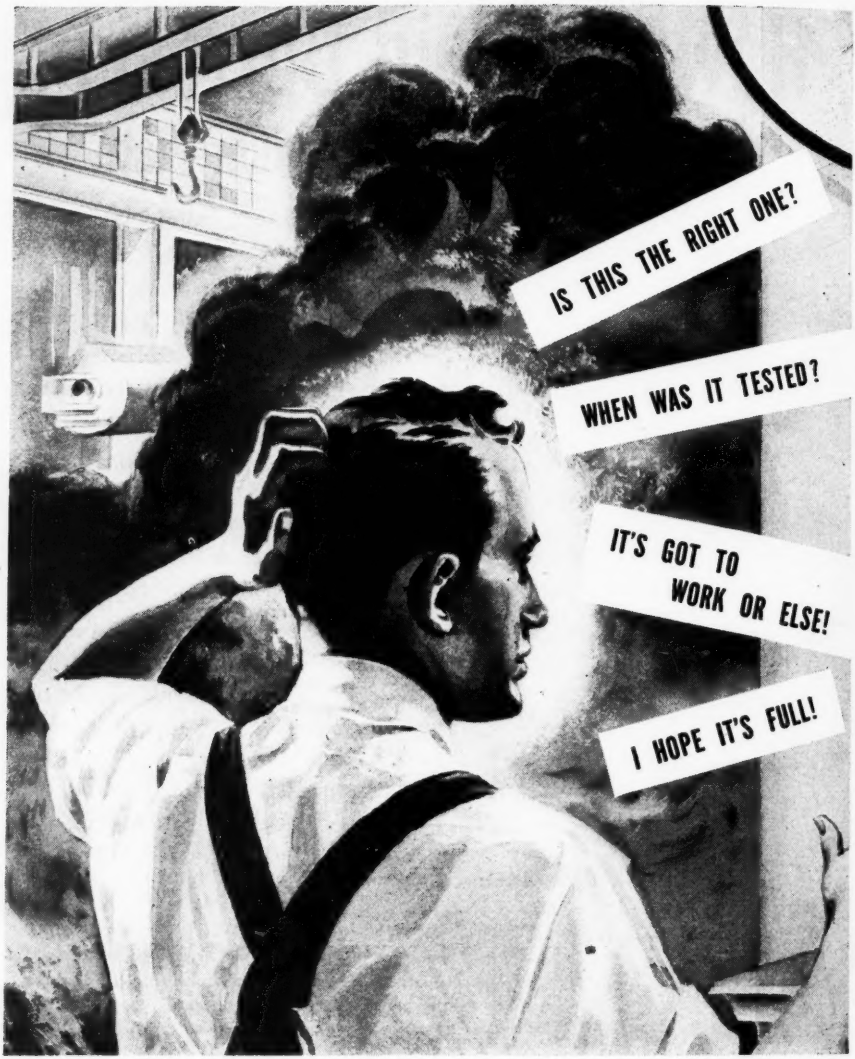

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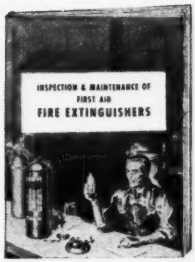

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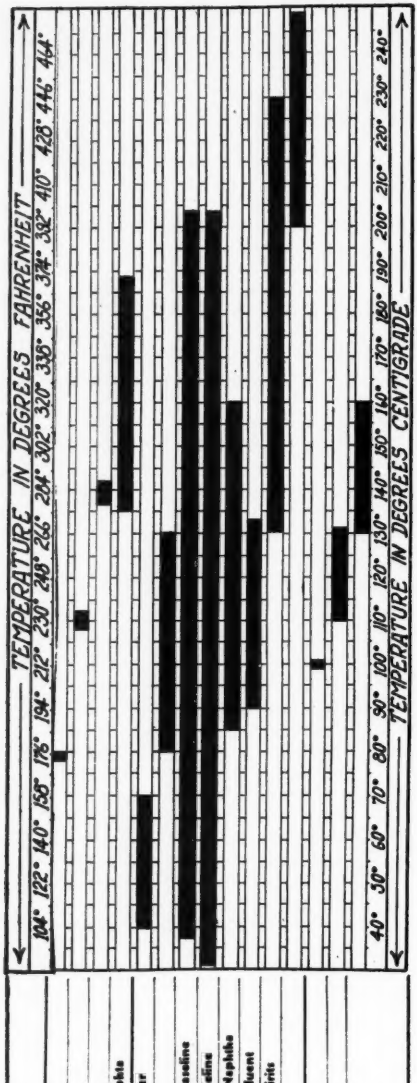

In this chart are shown several of the petroleum thinners used by the paint industry today. Through the use of such a chart, it is possible to obtain a quick impression of the distillation range of various solvents.

two items on the above list can be supplied by only a limited number of sources, due to the fact that they are a highly specialized product.

The test is relatively simple. The petroleum thinner under examination is added to a known weight of the standardized kauri-butanol solution until it becomes cloudy. The number of ml. required is known as the kauri-butanol value. In order to obtain a definite end point, the piece of paper is placed underneath the flask, and the titration is continued until a degree of cloudiness is obtained which makes the print illegible. If the following detailed instructions are followed carefully, duplicate tests should be obtained which will be accurate within plus or minus 0.1 ml.

The details of the procedure are as follows: The kauri-butanol solution is first weighed into the Ehrlenmeyer flask, using exactly 20.000 grams. This should be weighed accurately to the third decimal place, or if exact results are not required, to the second decimal place. Every care should be taken to prevent any evaporation of the butyl alcohol (butanol) from the solution, since this would change the standardized value of the solution. For this reason, it is advisable to use a glass-stoppered Ehrlenmeyer flask, such as an iodine flask.

The petroleum thinner is then added from a burette, keeping the temperature at 25.0 deg. C. plus or minus 0.2 deg. C. The first 30 ml. may be added rather rapidly because the end point surely will not be reached before that point. The balance

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of the thinner is then added, drop by drop, while the operator keeps the flask in a swirling motion. This circular action is necessary in order to prevent local precipitation or clouding. When the first stage of clouding begins, the printed paper should be placed underneath the flask. Usually, the incipient clouding will begin about 0.5 to 1.0 ml. before the end point is reached. Gradually, the type will appear blurred, and finally, as the titration continues, it will be impossible to read the printed matter. The number of ml. required to bring the titration to the end point is then recorded as the kauri-butanol value.

Obviously, the operator should have normal eyesight, or at least, satisfactorily corrected vision. In the event that any doubt arises regarding the end point, it is desirable to get two or more persons to make the observation and decide whether or not the printed matter is legible.

In order that one may get a relative idea of the values of some of the various thinners and solvents, the following tabulation is offered:

Name of Product	Average Kauri-butanol Value
Turpentine	61
Toluene	105
Mineral spirits	35
Solvent naphtha	85
Benzine (not benzene)	32
Solvesso No. 2	86
Lacquer diluent	39
V. M. & P. naphtha	37
Dipentene	105

In the tabulation above, some products have been listed which do not fall into the category of petroleum. This was done purposely for comparison purposes.

It is interesting to note that some organizations include an unusual, but desirable, method for specifying the kauri-butanol value of a petroleum thinner. This is accomplised by basing the comparison of kauri-butanol value with a blend of other materials. Specifically, reference is made to the Ordnance Department of the U. S. Army. In their specifications, they require that a value be obtained which is equivalent to a mixture of 40 parts of xylene and 60 parts naphtha which has an aniline point of 60 deg. This, however, only applies to the high-solvency type of naptha or thinner, such as those used in alkyd enamels.

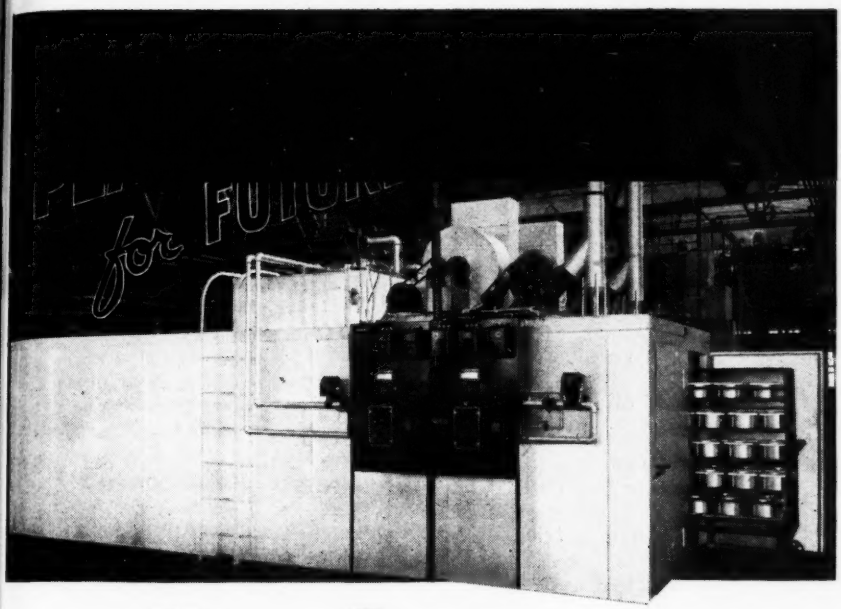
(To be concluded next month)

Silver Plating Aluminum

ACCORDING to an announcement made by the Technical Processes Division of Colonial Alloys Co., Philadelphia, Pa., silver may now be deposited electrolytically onto aluminum or aluminum alloys by a simple method known as the "Preplate Process," developed by this firm.

Silver deposits of considerable thickness can be made directly on aluminum surfaces, or follow a copper, nickel, zinc, or cadmium deposition. The aluminum is thoroughly cleaned as prescribed, passivated, immersed in Preplate solution for a few seconds, and then electroplated in the usual manner, using the regular equipment found in all plating shops. Adherence of the plate is said to be good, with the plate showing unusual torsion and corrosion resistance.

Due to its high rate of conductivity, silver plating as applied to lightweight aluminums is said to open up vast possibilities in the electrical equipment, appliance, transportation, and communications fields. Rated high on the scale in heat conductivity and transfer, silver on aluminums may be considered favorably in many heat transfer applications.



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The Chemistry of Electroplating

By Dr. C. B. F. Young, Consultant

Part 13

IN the previous article of this series a number of metals were discussed. In the present article more metals will be treated. The metals which are of primary importance to the electroplater are emphasized and the others are generally mentioned. In the present study, copper, silver, gold, platinum, rhodium, tungsten, chromium, molybdenum and vanadium are discussed. Copper, silver, gold, platinum, rhodium and tungsten are all below hydrogen in the electromotive series, therefore, do not displace this material from the acids, but can be dissolved only by oxidizing acids. In the case of gold, it is attacked only by a mixture of hydrochloric and nitric acids, which is aqua regia.

Copper has two valences, one and two. Univalent salts are called cuprous and the divalent salts are called cupric compounds.

This material being low in the electromotive series, and therefore rather inactive, sometimes is found free in nature. Free copper exists on the Michigan shore of Lake Superior. This has been mined very thoroughly and at present very little free copper exists there. One of the most important ores is chalcopyrite, $Cu_2S \cdot Fe_2S_3$. Copper pyrites, $CuFeS_2$, and Chalcocite, Cu_2S, are also valuable minerals. All the above are sulfides. Malachite, $Cu_3(OH)_2CO_3$, and aqurite, $Cu_3(OH)_2(CO_3)_2$, are basic carbonates which are important. Cuprite, Cu_2O, is also an important ore.

There are two methods of recovering copper from the complex ores. The first, a thermal method, which is becoming less important each day, consists of roasting the ores and removing most of the sulfur as sulfur dioxide. The resulting material is introduced into a blast furnace along with some unroasted ores, sand and coke. This removes some of the iron as a silicate slag. The resulting product, known as copper matte, is then Bessemerized with sand in a converter. This produces copper in the metallic state, although rather impure. The resulting material, known as Blister copper, contains some dissolved cuprous oxide. It is next melted and stirred with clean wood and the gas given off—carbon monoxide—by the organic material reduces the copper to the metallic state. In order to produce a very pure copper which is essential for electrical work, it must

e further purified by the electrolytic process, which consists of casting the copper into anodes and introducing the same into a sulfuric acid copper sulfate solution and electrolyzing, using pure copper as the starting cathode. This produces a copper of 99.99 per cent purity.

The second method and most important at the present time consists of introducing the ores into large bins or containers. Here sulfuric acid is poured over the entire mass and allowed to filter through the ore. In so doing the sulfuric acid reacts with the complex copper salts producing copper sulfate.

This solution is then taken to electrolytic tanks using insoluble anodes and copper sheets as cathodes. A current of 30 to 60 amperes per square foot is introduced and the copper ions in solution are reduced to metallic copper at the cathode. This produces a rather pure copper product in two operations.

Copper melts at 1083 deg. C. and boils at 2300 deg. C. The density of the material is 8.93, and the metal is very malleable and ductile. Copper does not unite with oxygen when both are perfectly dry. However, moist oxygen forms a thin film of cuprous oxide on the metal. Damp air forms a basic carbonate which is green. This metal does not displace hydrogen from dilute acids. However, oxygen acids are attacked by the element. Hydrochloric acid will act on copper if oxygen is present.

$$2Cu + 4HCl + O_2 = 2CuCl_2 + 2H_2O$$

The metal is used in large amounts for conducting electricity. It is used for electroplating, electrotyping, and making the following alloys: brass, bronze, bell metal, gun metal, barium, silver, and aluminum alloys.

Cuprous chloride, CuCl, may be made by boiling copper turnings, cupric chloride and hydrochloric acid together.

$$CuCl_2 + Cu = 2CuCl$$

This material is insoluble in water.

Cuprous oxide, Cu_2O, can be formed by gently heating copper in the presence of the atmosphere. The oxide has an attractive red color.

If sodium cyanide is added to a cupric salt, cupric cyanide, $Cu(CN)_2$, is precipitated. This material decomposes to form cuprous cyanide.

$$2Cu(CN)_2 = 2CuCN + C_2N_2$$

Cyanagen, C_2N_2, is liberated as a gas. Cuprous cyanide is insoluble in water but soluble in sodium cyanide solution, producing the double salt.

Sodium cupro-cyanide, $NaCu(CN)_2$, is used in the electroplating industry in large amounts and is made by dissolving cuprous cyanide in sodium cyanide solution.

$$NaCn + CuCN \rightarrow NaCu(CN)_2$$

There are many cupric salts but only the most important ones will be mentioned here. Cupric sulfate is formed by dissolving the oxide with sulfuric acid.

$$CuO + H_2SO_4 = CuSO_4 + H_2O$$

The salt crystallizes as the pentahydrate, $CuSO_4 \cdot 5H_2O$. This is known as blue vitriol. If ammonium hydroxide is added to copper sulfate, a precipitate is produced which is the pale green basic sulfate. If excess hydroxide is now added the complex compound, ammonia cupric sulfate, $Cu(NH_3)_4SO_4 \cdot H_2O$, results, which has a beautiful dark blue color. This is used as a test for copper. Cupric sulfate is used in large quantities to make up acid sulfate baths for electroplating, electrotyping, and electroforming of copper.

Cupric hydroxide, $Cu(OH)_2$, is a

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blue gelatinous precipitate produced by adding sodium hydroxide to a soluble cupric salt.

$$CuSO_4 + 2NaOH = Cu(OH)_2 + Na_2SO_4$$

This material is used as a spray on grape vines and other plants to prevent the growth of fungi.

Cupric oxide, CuO, is formed by heating copper in air or oxygen, or by igniting the nitrate.

Cupric nitrate, $Cu(NO_3)_2$, is obtained by treating copper with nitric acid.

$$8HNO_3 + 3Cu = 4H_2O + 2NO + 3Cu(NO_3)_2$$

It crystallizes out of solution with six molecules of water. $Cu(NO_3)_2 \cdot 6H_2O$.

Cupric cyanide cannot be precipitated from solution. If a soluble cupric salt is added to a cyanide solution, cuprous cyanide and cyanogen (a poisonous gas) is produced.

$$CuSO_4 + 2NaCN \rightarrow Na_2SO_4 + Cu(CN)_2$$
$$2Ca(CN)_2 \rightarrow 2CuCN + (CN)_2$$

All platers are familiar with the above reactions, as many times cyanide baths are made this way in the plating plant. If an excess of NaCN is added to the cuprous cyanide, the soluble complex is formed as has been pointed out above.

Cupric acetate is obtained by dissolving copper in acetic acid in the presence of oxygen.

$$6Cu + 8HC_2H_3O_2 + 3O_2 = 2Cu_3(OH)_2(C_2H_3O_2)_4 + 2H_2O$$

The basic acetates of copper dissolve in acetic acid from which copper acetate can be obtained.

Silver is found either in the native state, because of its inactivity, or in the combined form. However, most of

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The chloride, bromide, and iodide of silver are all insoluble in water. They can be produced by adding a halide to a soluble silver salt.

$$AgNO_3 + NaCl = AgCl + NaNO_3$$

Silver, like copper, gives an insoluble silver cyanide, AgCN, and then forms, with excess cyanide, the complex salt, sodium argenticyanide, $NaAg(CN)_2$.

Silver nitrate, $AgNO_3$, is formed by the interaction of nitric acid on the metal.

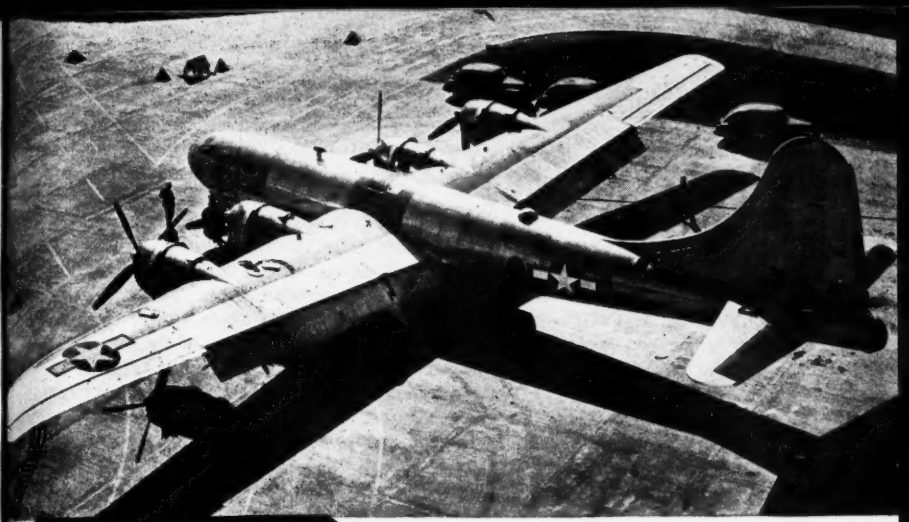
$$3Ag + 4HNO_3 = 3AgNO_3 + NO + 2H_2O$$

Gold is generally found in the free state encrusted in vains of quartz and also in some of the copper and lead ores. The golden colored material is the most malleable and ductile metal. The element melts at 1063 deg. C. Copper, and sometimes nickel, is generally mixed with the gold in order to increase its wearing qualities, and the karat is used to denote the percentage gold present. Pure gold is twenty-four karat. The metal is not affected by hydrogen sulfide, oxygen, or any acid, except selenic. It does, however, react with aqua regia, a mixture of nitric and hydrochloric acid, giving chlorauric acid, $HAuCl_4$. Aqua regia dissolves gold because free chlorine is produced. Aurocyanides (example, $KAu(CN)_2$) and auricyanides, (example. $KAu(CN)_4$) are formed by the action of potassium cyanide on aurius and auric compounds. These salts are used in the electrodeposition of gold.

Platinum is a grayish white metal with a melting point of 1755 deg. C. Being inactive, it is found in the free state in Russia, the United States, Africa, and so on. It also occurs in very small amounts in copper ores. The material is used to a great extent for chemical apparatus in the laboratory. The oxygen acids do not affect it, neither do the alkali carbonates, but aqua regia dissolves the material, forming chloroplatinic acid, H_2PtCl_6. It forms alloys with lead, antimony, and similar metals. If ammonium chloroplatinate, $(NH_4)_2PtCl_6$, is ignited, platinum sponge is produced. This form, due to its large surface, is used as a catalyst and also in electrical measuring instruments. Platinum in different and similar forms is used as a catalyst in the contact method of making sulfuric acid and in the oxidation of ammonia. Due to its inactivity, platinum is used to a large extent in the jewelry industry.

Platinum forms soluble complex phosphates which are used in the industry to deposit the element. The chemistry of these complexes is beyond the scope of these articles.

Platinum has a valence of two or four. If chlorine is passed over finely divided platinum which is heated to 250 deg. C., platinous chloride, $PtCl_2$, is formed. It has a greenish color, being insoluble in water, but will react with hydrochloric acid to form soluble chloroplatinous acid. A base precipitates platinous hydroxide, $Pt(OH)_2$, which is black. If this material is heated, the oxide, PtO, is



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formed and if strongly heated, the metal is produced.

Platino cyanides can be formed by adding the cyanide to a soluble salt. The formula of the potassium salt is $K_2Pt(CN)_4$.

Platinic chloride, $PtCl_4$, is formed by allowing the metal to react with aqua regia. This reaction produces chloroplatinic acid, H_2PtCl_6. A stream of chlorine is passed over this material which is heated to 360 deg. C., thus producing the platinic chloride. Platinic hydroxide, $Pt(OH)_4$, is precipitated when bases are added to chloroplatinic acid. This compound is amphoteric; that is, it reacts with either acids or bases.

Rhodium is not attacked by aqua regia, but does, however, react with chlorine. It is harder than platinum and is used with this metal to form allows which are harder than the original platinum. This element is found in complex copper and nickel ores and is a by-product of these industries. It forms complex amines and phosphates, both of which are used in electroplating baths for plating thin deposits of the metal.

Palladium is similar to platinum in many respects. This material was not used very much for plating until the present war but since the emergency, appreciable amounts have been so utilized. The element will dissolve in nitric acid and it forms complex cyanides and amines. The complex phosphates seem to give the best electrodeposits. One of the most interesting properties of palladium is its ability to absorb large volumes of hydrogen. One volume of the material can absorb 800-900 volumes of the gas. Palladium is not attacked by sulfides, oxygen, or moisture. The material is used as a catalyst in many instances.

Chromium is a very important element to the electroplating and steel alloying industry. The material is not found in the natural state due to its activity but it is generally mined as chromite, $Fe(CrO_2)_2$, in Rhodesia and New Caledonia. The metal can be obtained from the oxide by reducing with carbon in an electric furnace.

The material is a blue silvery metal which is very hard, having a melting point of 1520 deg. C. and a density of 6.9. Nitric acid does not affect the material, but it is readily soluble in hydrochloric acid. The metal has a valence of two, three, and six.

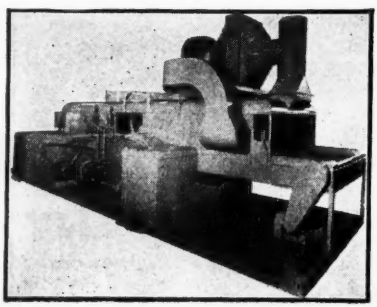
Chromous chloride, $CrCl_2$, is formed by dissolving chromium in hydrochloric acid.

$$Cr + 2HCl \rightarrow CrCl_2 + H_2$$

Chromic chloride, $CrCl_3$, can be made as follows:

$$2CrO_3 + 6HCl + 3C_2H_5OH \rightarrow 2CrCl_3 + 3C_2H_4O + 6H_2O$$

Here the ethyl alcohol is oxidized to



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the aldehyde. The material, $CrCl_3$, can also be formed by the reaction of HCl on $Cr(OH)_3$.

$$Cr(OH)_3 + 3HCl \rightarrow CrCl_3 + 3H_2O$$

If chromite is heated to 1000 deg. in air with sodium carbonate, the soluble sodium chromate is produced.

$$4Fe(CrO_2)_2 + 7O_2 + 8Na_2CO_3 \rightarrow 2Fe_2O_3 + 8CO_2 + 8Na_2CrO_4$$

If potassium chromate is acidified with sulfuric acid, potassium dichromate, $K_2Cr_2O_7$, results.

$$2K_2CrO_4 + H_2SO_4 = K_2CrO_7 + H_2O + K_2SO_4$$

Chromic acid or chromic anhydride, CrO_3, when dissolved in water, forms chromic acid. As can be seen from the formula, it is an anhydride. The material is made by adding concentrated sulfuric acid to a chromate or dichromate.

$$Na_2Cr_2O_7 + H_2SO_4 = Na_2SO_4 + H_2O + 2CrO_3$$

This material is used as an oxidizing agent and for forming a bath which can be used to plate chromium. If heated it loses oxygen and forms the green chromic oxide.

$$4CrO_3 = 2Cr_2O_3 + 3O_2$$

Chromous hydroxide, $Cr(OH)_2$, can be prepared as a yellow precipitate by adding a base to the chromous chloride.

Chromic hydroxide is prepared as a pale blue precipitate by adding ammonium hydroxide to a chromic salt. The formula is $2Cr(OH)_3 \cdot H_2O$. The material is, however, very instable.

There are two important ores of tungsten — Wolframite, $(FeMn)WO_4$, and Scheelite, $CaWO_4$. The element has the highest melting point of any metal, melting at 3370 deg. C. It is very heavy and hard and has a steel gray color. The material does not oxidize in the atmosphere and is not attacked by cold acids. It exhibits a valence of two, four, five, and six, and produces chlorides, oxides, and tungstates. One of the most important uses of tungsten is for lamp filaments in electric lights. It is also used in making high speed steels and other steel alloys.

Molybdenum occurs as molybdenite, MoS_2, which is a black finely powdered mineral resembling graphite, but being much heavier. The element is easily prepared by the Goldschmidt process. It is a silvery white metal, melting at 2500 deg. C. The principle use is for making ferro alloys. If MoS_2 is roasted, MoO_3 is formed. This can be dissolved in sodium hydroxide to produce sodium molybdate, Na_2MoO_4.

Vanadium is a silvery white metal being rather hard. There are no special uses for the metal as such, but vanadium ferro alloys are in demand because of their hardness and tensile strength. Vanadium melts at 1720 deg. C. The oxide of vanadium is used as a catalyst.

****

A study of chemistry would be incomplete unless gases under different temperatures and pressures were discussed. True, the electroplater has very little use for such but one should have a general knowledge of the action of one phase of matter if he is to be well rounded.

A very important law concerning the relationship of the volume of gases under different pressures was discovered by Boyle. He observed that if the pressure of a gas was doubled, the volume was one half the original; conversely, if the pressure was reduced to one half, the volume expanded to twice the original figure.

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This can be stated as a law as follows: The volume of a gas varies inversely as the pressure. Thus, this is an inverse ratio. It will be recalled that this type ratio was studied under neutralization of acids and bases. It may be said that as the pressure increases, the volume gets smaller. This is only common sense. Push down twice as hard on a pump and the piston cuts the volume to one half its original size. This law may be stated mathematically as follows:

$$\frac{P_1}{P_2} = \frac{V_2}{V_1} \text{ and } P_1V_1 = P_2V_2 \text{ and } P_1 = \frac{P_2V_2}{V_1}$$

$$\text{or } V_1 = \frac{V_2P_2}{P_1} \qquad \text{or } V_2 = \frac{P_1V_1}{P_2}$$

$$\text{or } P_2 = \frac{P_1V_1}{V_2}$$

Where P_1 = first pressure
P_2 = second pressure
V_1 = first volume
V_2 = second volume

Atmospheric pressure is generally measured in mm. of mercury. 760 mm. of mercury is considered the pressure at sea level. If the volume of a gas is taken at a lower pressure, the volume will increase. Suppose one had 500 c.c. of a gas at sea level and then went to a mountain top where the pressure was 740 mm. What would be the volume? We will have to solve for V_2.

$$V_2 = \frac{P_1V_1}{P_2}$$

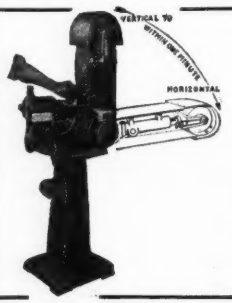
$$V_2 = \frac{760 \times 500}{740} = \frac{380000}{740}$$

$$V_2 = 513 \text{ c.c.}$$

Thus, there is an increase of 13 c.c.

Chemists use a temperature scale in gas measurements which is very helpful. It is the Centigrade scale of 273 deg. The reason for this figure is that if any gas is lowered to —273 deg. C. it liquifies. That is absolute zero. Thus, the absolute scale is 273 deg. C. If 20 deg. C. is desired in absolute, one adds 273 + 20 = 293 deg., which is absolute.

Charles noted that any gas when cooled decreased in volume. Thus, if a gas was lowered 1 deg. C., its volume was decreased by 1/273. Charles stated the law which now bears his name as follows: The volume of any gas varies directly as the absolute temperature. If one doubles the temperature of a gas, the volume also doubles provided the pressure remains constant. This may be stated mathematically as follows:



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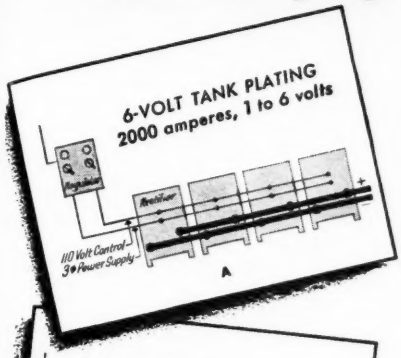
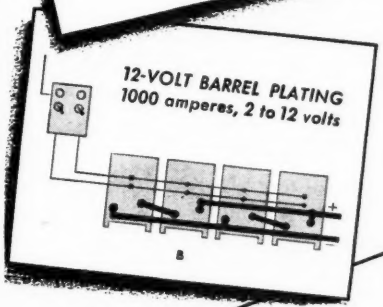
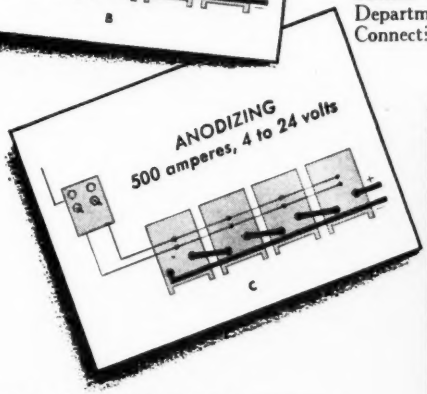






The great flexibility of the G-E Copper Oxide Rectifier in meeting varying D-C needs is plainly illustrated in the diagrams at the left.

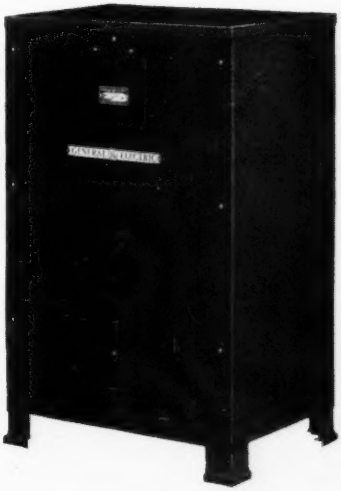
A–6-VOLT TANK PLATING: Connected in parallel, the four rectifiers give 2000 amperes at from 1 to 6 volts. The single regulator for the four units gives complete control over the full range output.

B–12-VOLT BARREL PLATING: Re-arranged in series-parallel, they give 1000 amperes at 2 to 12 volts.

C–ANODIZING: The same four rectifiers reconnected in series for an anodizing job requiring 500 amperes at 4 to 24 volts.

These are only three common examples of the wide variety of groupings that can be obtained with G-E Copper Oxide Rectifiers to serve specific needs, including 40 volt anodizing.

Why not investigate the potential uses of G-E Copper Oxide Rectifiers in your electroplating? G-E Tungar and Metallic Rectifier engineers will be glad to consult with you. Write to Section A644-70, Appliance and Merchandise Department, General Electric Co., Bridgeport, Connecticut.



Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news every weekday 6:45 P.M. EWT, CBS.

BUY WAR BONDS

GENERAL ELECTRIC

$$\frac{V_1}{V_2} = \frac{T_1}{T_2} \quad \text{or} \quad V_1T_2 = V_2T_1 \quad \text{and} \quad V_1 = \frac{V_2T_1}{T_2}$$

$$\text{or } V_2 = \frac{V_1T_2}{T_1}$$

$$\text{or } T_2 = \frac{V_2T_1}{V_1}$$

$$\text{or } T_1 = \frac{V_1T_2}{V_2}$$

An illustration will serve to make this clear. 200 c.c. of a gas at 273 deg. A. is raised to 473 deg. A. What is its volume provided the pressure remains constant? In this case V_2 is desired.

$$\frac{V_2}{T_2} = \frac{V_1}{T_1}, \quad V_2 = \frac{V_1T_2}{T_1}$$

$$V_2 = \frac{200 \times 473}{273} = \frac{94600}{273}$$

$$V_2 = 346 \text{ c.c.}$$

Thus, the volume will go from 200 c.c. to 346 c.c. provided the pressure remains constant.

It will be noted that the above always states that the pressure remains constant. If this is not true, erroneous results will be obtained. It is possible to take into consideration the temperature, pressure, and volume relationship. In other words, we can combine Charles' and Boyles' law as shown below:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \text{ or}$$

$$P_1 = \frac{P_2V_2T_1}{V_1T_2} \text{ or } P_2 = \frac{P_1V_1T_2}{T_1V_2}$$

$$V_1 = \frac{P_2V_2T_1}{T_2P_1} \text{ or } V_2 = \frac{V_1T_2P_1}{P_2T_1}$$

$$T_1 = \frac{P_1V_1T_2}{P_2V_2} \text{ or } T_2 = \frac{T_1P_2V_2}{P_1V_1}$$

A problem will help to illustrate this. 200 c.c. of a gas at 700 mm. pressure and 200 deg. A. is heated to 300 deg. A. and has a volume of 600 c.c. What is the final pressure?

$$P_2 = \frac{P_1V_1T_2}{T_1V_2}$$

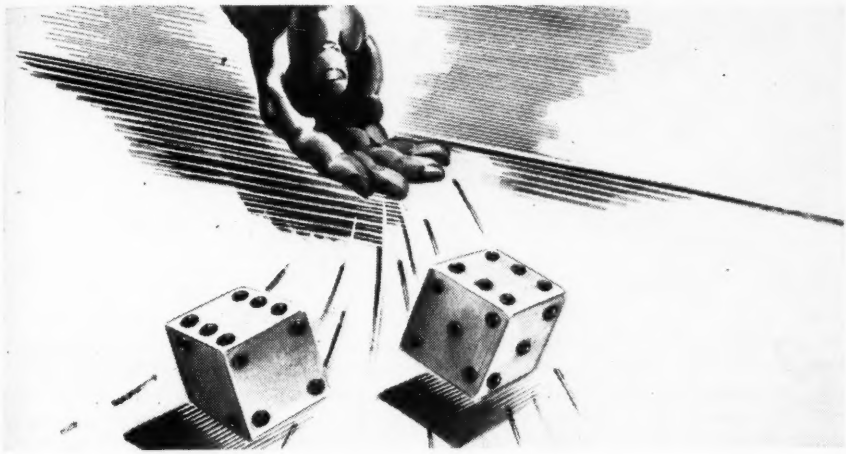
$$P_2 = \frac{700 \times 200 \times 300}{200 \times 600} = \frac{42{,}000{,}000}{120{,}000} =$$

350 mm.

Selas "Liqui-jector." Selas Corporation of America, Erie Ave. & D St., Philadelphia 34, Pa., now has available a four-page illustrated bulletin containing instructions for installation, operation, and maintenance of the Selas Model A-150-1 "Liqui-jector"—a device for use in connection with air guns, sprays and brushes in applying industrial finishes, which is constructed to automatically and continuously remove condensate (droplets, slugs or mist) from compressed air and gas lines. Copy of Bulletin 725-C free upon request.

Divine Abrasive Belt Polishing Machines. A bulletin containing illustrations, descriptions, and specifications of the VM-DBX and VCS-DBX Abrasive Belt Polishing Machines marketed by Divine Brothers Co., Utica, N. Y., has been released by this firm. Copy free upon request.

Don't Gamble *with* Black Finishes



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MIDDLETOWN, CONNECTICUT

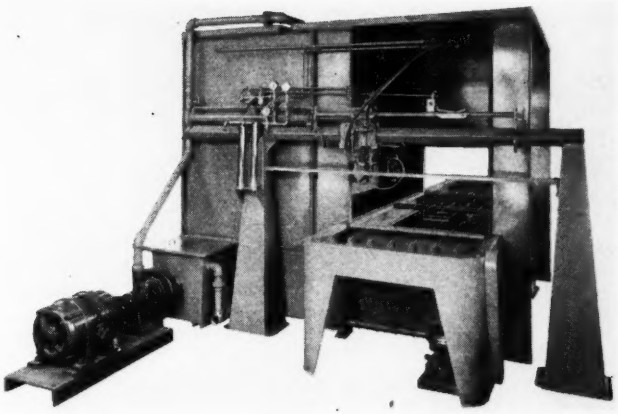
Care and Correct Use In Automatic Spray Finishing

By FRANK V. FAULHABER

CARE and conservation of machinery and equipment, in combination with correct usage, is always desirable, but with finishing plants striving for topmost production, and products at a premium, it becomes all the more imperative. This is particularly well to bear in mind as respects automatic spray equipment, and is of additional import when we consider that today employees are constantly changing, with incident necessity for breaking in anew.

Many plants, including the smaller shops, to accommodate a larger volume of work, are installing automatic spray equipment, and here, initially, a few vital points merit special stressing. The finishing layout should be so planned as to eliminate all possible handling, trucking and transporting. Automatic spraying permits economizing of floor space, by itself, but the equipment should also be so

This machine is designed to coat shells automaticallly. A little additional precaution in maintenance and use enables the unit to perform its vital war job more efficiently.



The illustration shows a reciprocating type spray machine which is fully automatic with the exception of the small amount of peridodic maintenance required.

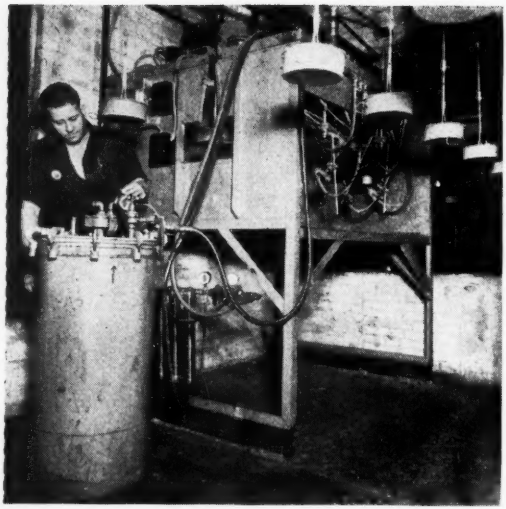
arranged as to coordinate efficiently with other necessary finishing processes and operations.

Apart from expediting production, mechanical spray equipment also makes for greater uniformity of finish, the apparatus available today being suitable for a vast range of varying lines of work. The smoother, steadier work possible also conduces towards fewer rejects with incident need for less inspection. Less expensive, too, is production by way of automatic spray equipment, nor is such operation surrounded with the hazards true of the manual spray operation, the human factor always having appreciable bearing on accidents.

As efficient as automatic spray installations have proved to be, they can only serve to the mass production of units of uniform construction. The finishing materials in use for automatic spraying must be especially prepared to ensure perfect performance. The spray guns and the finishing materials, in fact, are the two paramount factors. Wherever there is variation in the product to be finished, necessary alterations in the setup can be made to accommodate. If oblivious to this need, the most costly automatic spray equipment can prove a liability to the management.

Then there is the matter of proper care of this equipment, so vital, currently. Particularly the newcomer at this work must be familiarized with the proper regulation of the different adjustments of the spray guns. These adjustments are varied, depending of the finishing materials in use and the character of work. In some plants it is policy regularly to stage employee meetings, for the interchange of ideas, suggestions, pointers and experiences, where not only the novitiate but also the old-timer can profit by picking up an idea or two, old or new, thus befitting the shop's forces to perform their duties more efficiently.

A mechanical spray gun is maintained in position by an adjustable clamp attached to the under side of the gun body. This clamp may be attached to either side of the spray gun. The operator should fasten the clamp to a convenient ¾-inch support rod, 6 to 10 inches from the work to be sprayed, and in the most appropriate position to achieve the desired effect. Bear in mind, a uniform application of finishing material should develop over the entire area of spray. Excessive mist or fumes around the main portion of spray signifies that there is too much atom-



Nominal timely care results in smoother and more uniform production with the machine illustrated, which is being used to spray sand mines.

izing air pressure. Whenever there is blowing through the center of the spray, bringing about an excess of finishing material at both ends of the spray, and a shortage in the center, it also indicates an excess of atomizing air pressure.

When the unit under finish is spattered or stippled with material, the operator is working with insufficient atomizing air pressure, and when there are runs or sags, this is a result of too much material. There is a varying range of controversy as respects what is the proper atomizing air pressure, the product under finish and the material in use being governing factors, but this may run anywhere from 10 to 80 pounds, although, for most purposes, 30 to 65 pounds air pressure prevails.

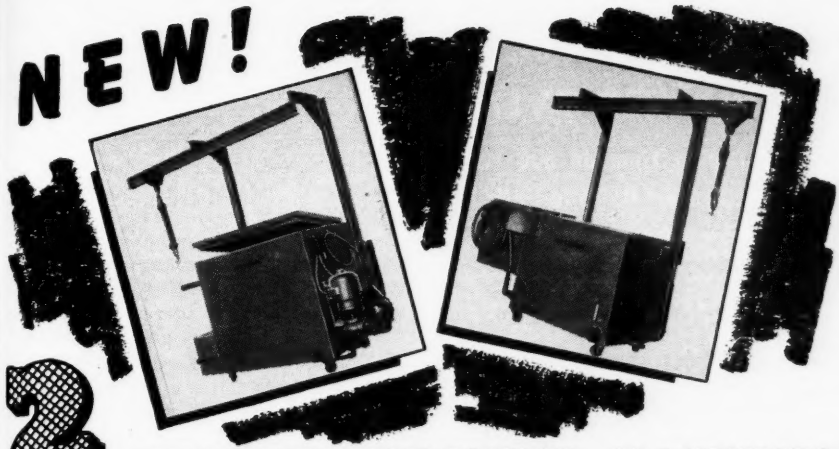
The atomizing air pressure can be regulated by means of an air regulator or air transformer. Additional air pressure adjustment may be effected by aid of an air adjusting valve. This air adjusting valve is turned to the left to increase the air pressure, and to the right when desiring to decrease it.

Reverting to spray gun adjustment, there is a small set screw in the clamp collar which can be loosened until the collar and the gun turn on the clamp. The gun is then tilted to the proper angle and the set screw tightened. To turn the spray gun on and off, hand or mechanically operated air valves may be used.

Two separate air lines, one of them regulated and the other unregulated, are required to operate the spray gun. The regulated air atomizes the finishing material at the spray gun nozzle, and the unregulated air actuates the air piston, causing the fluid needle to open and close.

To make the proper connection, the operator attaches the regulated air hose to the regulated air pressure inlet nipple, then attaching the unregulated air pressure hose to the unregulated air pressure inlet nipple. The fluid hose is then connected to the fluid inlet nipple.

On the spray gun is a spreader adjustment valve by which the width of the spray pattern is controlled. The operator turns this spreader adjustment valve until zero coincides with the index line on the gun body, when desiring to obtain a round spray. For flat sprays, the valve is turned from zero up to 15, depending upon the width desired. The graduations permit precise settings for any spray pattern sought.



2 PORTABLE WASHING MACHINES

for batch cleaning of metal parts

The cleaning of metal parts in baskets, on racks, or individually, is ideally handled by these two new portable machines. Although each is designed for a special use, both machines have certain common advantages.

Both are used with any cleaning agent (alkaline, solvent emulsion, straight solvent). Any type of heat can be utilized. Both are portable—can be easily moved right up to the job, or from one job to another.

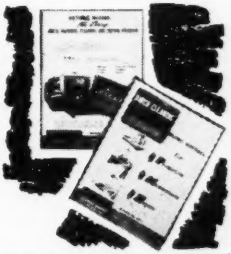
DIP-AGITATING TYPE—Adds strong up and down mechanical agitation to the soaking action of the cleaning solution. Entire surface of load is "brushed" by flow of liquid as much as 30 times per minute, insuring uniform cleaning.

Used for cleaning, washing, paint-stripping, anti-rusting, rust-proofing, rinsing, chemical treatments, coating operations, etc.

SPRAY TYPE—Parts are spray-cleaned in one step as solution is continuously filtered and separated from oil carried off. A rapid cleaning process, requiring little solution, a small amount of heat and very short heating up time.

This machine is ideally adapted for use in similar operations where relatively small series of large, heavy parts are handled in process of fabrication, or before, and during, maintenance and repair. Smaller parts can also be handled in baskets, or on racks.

***SEND FOR** Your copy of new Bulletin 4E2 "Batch Cleaning in Portable Metal Washing Machines". Bulletin 4E1 describing other "OPTIMUS Machines for Every Metal Washing, Cleaning and Drying Problem" also available.*



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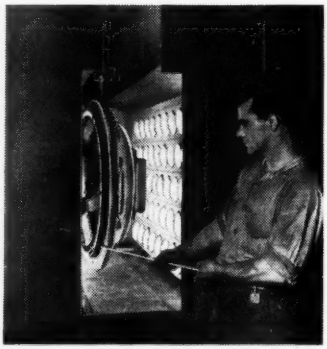
Cuts Drying Time on 600 Lb. Assembly from DAYS to ½ Hr.!

Speeds Production for Westfield Manufacturing Co.



★ At Westfield, 600-lb. Commander's Vision Cupolas are (1) dried in 5 minutes after being washed free of grease, (2) cured in 10 minutes after being spray coated with primer and (3) finish-dried in 15 minutes after being finish-sprayed outside and inside. TOTAL TIME: ½ HOUR! ★ You, too, can speed production with Jensen "Dual-heat" Ovens. Get details from distributors listed below.

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Seattle 1, Washington

MONTREAL
Ideal Electric Co., Inc.
705 Craig Street, West
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COLUMBUS
Electric Power Equip. Co.
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SOUTH BEND
Peltz-Kaufer Co., Inc.
209 College Street
South Bend, Ind.

★

JENSEN SPECIALTIES, Inc.
12151 GRAND RIVER • DETROIT 4, MICH.

To control the fluid pressure of the material entering the gun, this is accomplished at the pressure feed tank by means of a fluid pressure regulator. To increase the fluid pressure, the operator turns the regulator adjusting screw inward, to the right; by turning it outward, to the left, the fluid pressure is decreased. At the rear of the spray gun is a fluid needle adjusting screw by which the amount of fluid flow at the spray gun nozzle is controlled. To increase the fluid flow, the operator must turn the adjusting screw outward, to the left; and to decrease the material flow, he must turn this adjusting screw inward, to the right. Before turning this adjusting screw inward or outward, the operator should loosen the fluid needle adjusting screw lock nut, and after the desired adjustment is made, this lock nut should be retightened against the gun body.

In deciding upon the proper air and fluid pressures, the first step is to shut off the atomizing air to the spray gun. Next, set the spreader adjustment valve at a dial setting of 10 or 12, and open the fluid adjusting screw several turns. Then open the fluid outlet valve on the pressure feed tank, allowing the fluid to enter the fluid hose and gun. Next procedure is to slowly increase the fluid pressure until the material flows from the gun nozzle in a solid stream. The air outlet valve is then opened, allowing air to enter the spray gun. The operator can increase the atomizing air pressure by means of the air regulator until the stream of the material is atomized as desired.

When a wider spray is wanted, the operator must open the spreader adjustment valve. Raising the gun further from the work will also result in a wider spray. When a greater flow of material is sought, the operator should increase the fluid pressure on the pressure feed tank.

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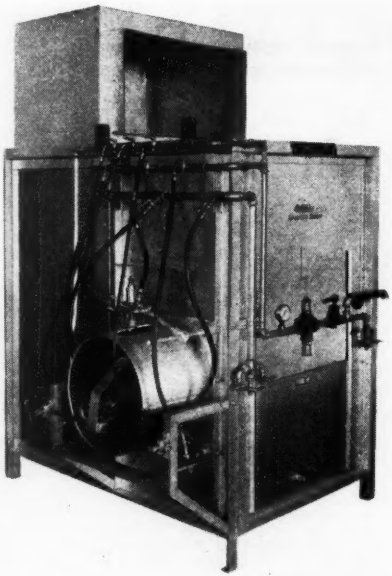
This can also be brought about by turning the fluid adjusting screw on the spray gun to the left. The air pressure should be increased until the finishing material is properly atomized and an appropriate spray pattern is achieved.



The pipe-coating machine shown here will positively maintain expected production when given a small amount of extra daily care.

It must be borne in mind that more air pressure than necessary conduces to excessive atomization and will result in a split spray. Contrariwise, inadequate air pressure will produce improper atomization, the material overlaying in small beads or dots.

The finishing plant's spray gun adjustments will naturally vary for different materials and different conditions. Major points are to make fluid pressure adjustment, atomizing pressure adjustment, and spray width adjustment until a uniform spray pattern of the necessary width is brought about.

So many times the entire finishing routine is upset by reason of spray gun troubles that impede and decrease a plant's output. This is of vital moment, currently, when the management objectifies for more and more production to fulfill exigent demands. And so many of these spray gun troubles may so easily be avoided, by means of some timely attention to and care of the automatic spray guns. The need for timeful care and consideration of this matter becomes all the more imperative when it is reflected that so many plants operate overtime, on two and three shifts. Some spray guns are almost always in use. This all makes for increased wear and breakdown.

Even under ordinary conditions a spray gun should be cleaned daily. Considerable alone might be written concerning the matter of lubrication. It can be but touched upon here, but suffice it to state the wise, foresighted plant management will not try to economize by purchasing cheap, inferior lubricants. The better product will prove the cheaper, in the long run, although initially perhaps a little more expensive.

For instance, the piston leather in the air cylinder at the rear of the spray gun should be lubricated daily. The operator should apply a few drops of oil in the small holes in the cylinder cover. Occasionally this piston leather should be removed and a coat of light grease applied to the interior of the air chamber. The operator should lubricate daily the fluid needle packing, by placing a few drops of oil on the needle where it enters the fluid needle packing nut. He should keep this packing nut tight, but not so tight that the packing grips the needle.

A material leak around the packing nut, or small holes in the fluid

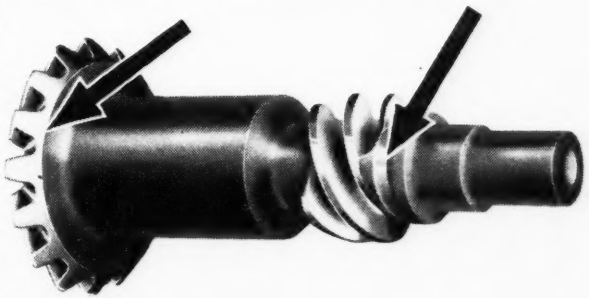
5 MICCRO COATINGS *for* MASKING PARTS *for* SELECTIVE PLATING

To meet every need for masking parts prior to selective plating, Michigan Chrome and Chemical Company produces Miccro-Supreme Stop-Off Lacquers in two colors (red and black) and Miccrome in three colors (red, blue and green). Among the principal characteristics of these coating materials are unexcelled protective qualities, excellent adhesion, and good dielectric strength. Each can be quickly and easily applied or removed.

If you do selective plating, one of these materials is exactly suited to your requirements. Full information is contained in our "Manual of Protective Coatings"—available to you without charge or obligation.

Above: Part being masked for hard chromium plating. Miccrome was especially developed for this purpose. Miccro-Supreme Stop-Off lacquers HR-302 and HB-401 are also widely used.

At right: This part was masked with Stop-Off Lacquer for copper plating prior to carburizing. Gear teeth only were stopped off. Note clean, sharp lines of demarcation.



MICHIGAN CHROME & CHEMICAL CO.
6342 EAST JEFFERSON • DETROIT 7, MICHIGAN

needle shield, is caused by a loose packing nut or dry packing. This packing nut map become dry or hardened after undergoing undue service. The packing may be lubricated by unscrewing the packing nut, then applying a few drops of oil in the gun body recess. The packing nut can be tightened with the fingers.

In such cases where a leak persists because of faulty packing, a new packing should be substituted. In such cases where leak continues after lubricating the piston leather, and where inspection reveals this leather as badly worn or hardened, a replacement may be opportune.

It should be plant policy that the spray guns and fluid hoses are regularly and thoroughly cleaned by blowing a thinner back through them, so that no hardened finishing material possibly may cause leakage, dripping or stoppage. A forehanded procedure is to examine and test carefully a material hose, before any period of inactivity, lest any remaining material clinging in a thin film to its inner walls will dry, crack and flake off, later, when this hose is again placed in service.

One efficacious method is to fill a hose with turpentine, or some equally suitable solvent, plugging up both ends, then leaving this material in the hose, overnight, next morning freeing the hose of this material, then attaching it to the airline. Periodic practice of this precautious routine, vital and of significance as it is currently, will ensure longer operating life for the hose, besides conducing to more efficient production. In such cases where a hose indicates a tendency to peel, it may be advisable to place a new one in service.

The material hose of an automatic spray system, in fact, should be

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1 **BOND COMMITTEE**—Appoint a 6th War Loan Bond Committee from labor, management and each representative group of the firm.

2 **TEAM CAPTAINS**—Select a team captain for each 10 workers. Use returned veterans whenever possible.

3 **QUOTA**—Set a quota for each department and each employee.

4 **MEETING OF CAPTAINS**—Have them study the Treasury booklet, *Getting the Order.* Outline sales procedure.

5 **ASSIGNMENTS**—Assign responsibilities for the opening rally, pre-drive letters, and competitive progress boards, etc.

6 **CARD FOR EACH WORKER**—Dignify each personal approach with a pledge, order, or authorization card made out in the name of each worker. Notate each card with the amount of subscription expected.

7 **RESOLICITATION**—Personally recontact each employee toward the end of the drive in a fast mop-up campaign. If you need help, call upon your State Payroll Chairman. He's ready with a fully detailed plan—NOW!

8 **ADVERTISE THE DRIVE**—Use all possible space in the regular media you employ to tell the story of War Bonds!

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cleaned at the close of each day's work, if not continuously in service, a suitable cleaning solvent being permitted to run through until it is thoroughly cleaned. When the cleaning material is emptied, the hose may be dried by connecting it to an airline and letting compressed air circulate through it. Hose not in service may then be laid out in a straight line, where it will not be interfered with, to prevent kinks, dents, crevices and other disintegrations, as so frequently happens when a hose is indifferently thrown about, put up in almost any convenient place, sometimes even being permitted to hang and twist all out of shape.

Other effective automatic spray equipment cleaning methods are had by removing the excess finishing material from the spray gun, hose and material container, thusly: place a sufficient amount of solvent suitable for the material used in the container, and spray it in the customary manner. After spraying the solvent, the spray gun and the fluid lines should be blown out with air and then dried.

If the holes in the air cap of the spray gun should become clogged, the cap should be immersed in appropriate solvent, then cleaning holes with pipe cleaner, broom bristle or similar means. However, a hard or sharp instrument should not be used for this purpose, as it may permanently damage the cap.

Sometimes there is a fluid drip at the gun nozzle. This may be due to improper seating of the fluid needle, in turn occasioned by a collection of material in the fluid tip. Or, the fluid needle packing may be gripping the needle. The operator should remove the fluid tip and clean it in solvent. Also, a few drops of oil should be placed on the fluid needle near the packing nut.

To simplify automatic spray finishing operations, and in the interest of fewer production delays and greater efficiency, it is well to bear in mind, as respects a plant's paint-circulating system, whenever a fluid is pumped through a pipe, the pressure in that line varies at every point. A foremost requisite, consequently, is a fluid pressure regulator on the system at each juncture where finish is to be applied, for the purpose of equalizing the pressure at each outlet, or to ensure the correct reduction from the main line pressure. Present-day fluid pressure regulators are so sensitive that there is almost no perceptible variation in the regulated pressure when the spray gun is opened.

The pressure is controlled by a removable key, and an incidental feature is afforded for use when blowing back the paint hose. These two integrals operate individually, permitting supervision by the department foreman and to ascertain whether correct operating pressure is being maintained. This is significant, when we consider the personal quirks of some operators who may cause improper manipulation of the equipment to the detriment of the spray-work.

The pipe line should be suitable for the plant's purposes, giving consideration to size and capacity, also the proper linear flow, paint velocity and the length of the lines. If the paint circulating system is efficiently laid out, the problems of cleaning the apparatus becomes negligible. Most attention is required at the time when a change is made to another paint or at the conclusion of a working session when operations halt.

Republic Homogeneous Lead Anodes. A four-page illustrated folder which fully covers the line of homogeneous lead anodes for chrome plating offered by the Republic Lead Equipment Co., 7930 Jones Rd., Cleveland 5, Ohio, has been prepared by this firm. Copy free.

PROTECT Precise Engineering Surfaces with RUSTEX No. 2

SURFACE CONDITIONER

Prevent inter-department waste caused by RUST

BY USING RUSTEX No. 2

- ★ **in cleaning and rinsing tanks**
- ★ **in water testing tanks**
- ★ **in soluble cutting oil**

Only a very little of Rustex No. 2 will do the job—just add ¼ to ½ oz. to a gallon of water. Rustex No. 2 is a plain white powder—harmless to hands or clothing. It does not injure the most highly finished metal surface nor will it measurebly increase the physical dimensions.

WE GUARANTEE EVERY POUND OF RUSTEX No. 2 to do what we claim for it. You must be satisfied.

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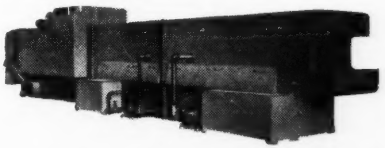
DEPT. FP
A Quarter Century of Successful Service to Industry

METAL WASHERS
ENGINEERED FOR Efficiency

Metal cleaning is an important step in the production process. Efficiency and speed are just as important there as in any other production department. Whether your metal cleaning problem is to provide a perfect bond before finishing operations such as rustproofing, painting, galvanizing, or electroplating . . . or cleaning between machinings . . . prior to gauging, inspection or assembly . . . or prior to packing, storing, and shipping . . . it is possible our engineers can help you.

The American line of Metal Washing Machines employs new principles of design and construction that will give you a wholly new concept of metal washing efficiency. There is a type to answer every specific requirement, each incorporating features that are the exclusive product of long research by American's engineers.

If you will write us about your metal cleaning problems, our engineers will be glad to make specific recommendations. You will be under no obligation, and we will give your problem the benefit of our engineering experience in the metal cleaning field.



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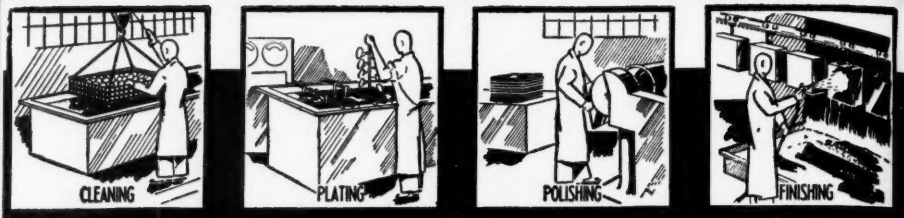
FOUNDRY EQUIPMENT CO.

525 S. Byrkit St., Mishawaka, Ind.



News of the Industry

Ferro Enamel to Build West Coast Plant

Plans for a new manufacturing plant to be located in the Los Angeles area are announced by Robert A. Weaver,

Robert A. Weaver

president of Ferro Enamel Corp., 4150 E. 56th St., Cleveland 5, Ohio. John A. Rumer, long identified with Ferro and for the past ten years West Coast representative, has been appointed manager of the new operation.

The new plant, according to Mr. Weaver, will produce porcelain enamel frit and synthetic enamel industrial paints. In addition, the complete line of other Ferro products—such as clays, oxides, chemicals, driers and various other supplies—will be warehoused at the new plant and distributed throughout the western states and foreign countries bordering on the Pacific. Ferro's engineering service in the porcelain enameling and other fields will also be available through this new organization.

The decision to build a West Coast plant—the ninth frit smelting plant to be put into operation by Ferro—was reached after recent first-hand surveys of business in this area by Ferro officials.

DeVilbiss New President

The election of Howard P. DeVilbiss as president and general manager and of Allen D. Gutchess as chairman of the board and active senior executive of The DeVilbiss Company, 300 Phillips Ave., Toledo, Ohio, was announced recently following a meeting of the Board of Directors. The new president has served for several years as vice president of the company, a leading producer of spray painting equipment, exhaust systems, air compressors, hose and connections. Mr. Gutchess has been president of the firm since 1929. As board chairman, he succeeds W. M. Booker, who will continue as a member of the board.

Coincident with these changes, Frank A. Bailey, vice president and general manager who has been with the company for 34 years, is retiring because of poor health. Roy A. Guyer continues as vice president in charge of sales and becomes a director of the concern.

The company has also announced the appointment by Howard P. DeVilbiss of Don J. Peeps, of the engineering staff, as acting chief engineer.

New Sales Territory Formed by Norton

Norton Company, Worcester 6, Mass., announces the formation of a new sales territory to be known as the West Central Rocky Mountain District. It will be under the supervision of Ralph O. Anderson as district manager, with headquarters in Denver, Colo. Mr. Anderson has been with Norton Company over thirty years and for a considerable time was district manager in Pittsburgh. For the last few years he has been doing special sales work.

Mr. F. L. Anderson, Mr. G. W. Thomson, and Mr. G. L. Freeman with headquarters in Kansas City, Mo., Dallas, Tex., and Houston, Tex., respectively will report direct to Mr. R. O. Anderson who is responsible to Mr. W. E. Shumway, sales manager, western region.

Midwestern Director Appointed by Mitchell-Bradford

The Mitchell-Bradford Chemical Co., 2446D Main St., Stratford P. O., Bridgeport, Conn., mannufacturer of Black-Magic products and processes for treatment of ferrous and non-ferrous metals, and of Silco, the new inorganic coating, announces the appointment of William H. Price, Jr., as Midwestern regional director.

Mr. Price has had considerable experience in the engineering, service, technical, and sales end of the business, having first developed the Eastern Seaboard area for the company and later spending sometime at its headquarters in Bridgeport, organizing a semi-national plan of distribution. The new Midwestern regional office will embrace a total of 11 states, including Illinois, and Mr. Price will temporarily headquarter at 432 Roslyn Pl., Chicago 14, Illinois.

Turner Appointed Assistant Sales Manager of Osborn Brush Division

The promotion of F. T. Turner to assistant sales manager of its Brush Division is announced by The Osborn Mfg. Co., 4501 Hamilton Ave., Cleveland, Ohio. In his new duties Mr. Turner will organize sales planning for the division and will assist M. C. Pecsok, sales manager, in supervision of the sales force.

F. T. Turner

Mr. Turner, a graduate of Cornell University in Mechanical Engineering, first joined Osborn in 1932, being employed in the Technical Department on design and application of power driven brushes. For several years he represented the company in the Pittsburgh area as sales and service engineer. He was recently in the home office on special assignments.

Burke Appointed Sales Manager

Casper Apeland, general maanger of the Zapon Division of Atlas Powder Company, announces that Gordon D. Burke has been appointed sales manager for the Western Sales Division.

Born in Ottawa, Canada, in 1905, Mr. Burke was educated at Ottawa University. In 1929 he became associated with Brevolite Lacquer Company, which was later acquired by Atlas Powder Company. From 1932 to 1938 he was a salesman in the North Chicago area, and from 1938 to 1941 acted as technical advisor to the sales department in connection with industrial finishes. In October, 1941, Mr. Burke was transferred to Wilmington as manager of priorities for the purchasing department where he remained until his present appointment.

L. F. Weyand Promoted

L. F. Weyand, general sales manager of the Adhesive and Coatings Division of Minnesota Mining & Mfg. Co., since 1936, has been promoted to general manager, a new post entailing responsibility for all production, sales, research, and laboratory activities of that division.

L. F. Weyand

Mr. Weyand has been associated with the Minnesota Mining & Mfg. Co. for 28 years. Under his leadership, the Adhesive and Coatings Division has become widely diversified, both as to the kinds of adhesives produced and the classes of trade served, and has grown to one of the most important divisions of the 3-M organization.

Mr. Weyand will continue to maintain headquarters at the 3-M factory in Detroit, where all adhesive and coating activities of the company have been centered for eight years. The company's executive headquarters are in St. Paul, Minnesota.

Du Pont Appoints Technical Representative

H. L. Benner has been appointed Detroit technical representative of the Electroplating Division of E. I. du Pont de Nemours & Co., Wilmington 98, Delaware.

Mr. Benner formerly was in charge of electroplating service and development at the Niagara Falls, N. Y., laboratory of the Du Pont Company. With headquarters at 1530 E. Mancock Ave., Detroit, he will cover all of Michigan, except the Upper Penninsula, reporting to the Chicago office of Du Pont's Electrochemicals Department.

Rheem Acquisition and Appointments

Rheem Research Products, Inc., 2523 Pennyslvania Ave., Baltimore 13, Md., manufacturer of "Iridite"—a treatment in several colors for corrosion-proofing zinc and cadmium surfaces—has announced the acquisition of a West Coast research and manufacturing branch and the appointment of three new distributors.

The executive offices of the West Coast plant and laboratory are at 714 W. Olympic Blvd., Los Angeles 15, Calif. The new distributors are: MacDermid, Inc., Waterbury 68, Conn.; Wagner Brothers, Detroit 2, Mich.; and J. C. Miller, Grand Rapids 4, Mich. The company also maintains a branch office at 20 E. Jackson Blvd., Chicago, Illinois.

BIONOL--Cleaner and Degreaser

REMOVES OIL, GREASE, SMUT, GRIME, DRAWING AND BUFFING COMPOUNDS. **BIONOL** LEAVES A CHEMICALLY CLEAN SURFACE. **BIONOL** IS NON-TOXIC, NON-CAUSTIC, NON-CORROSIVE, NON-INFLAMMABLE AND HARMLESS TO THE SKIN.

BIOFEN LABORATORIES ● **14 Sixth Street, Bridgeport 7, Conn.**

"STURDY-BILT" SIMPLEX METAL CLEANING EQUIPMENT

Delivers clean, dry PARTS.
Removes oil, grease and chips.
Provides low cost operation.

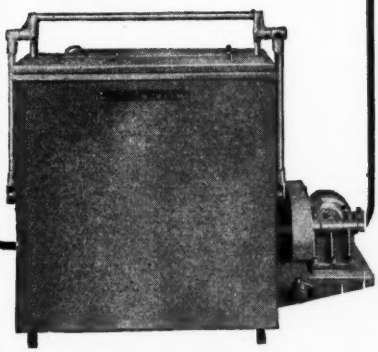
Active SOAK

Operating UP and DOWN into the TANK.

Write for details

Sturdy-Bilt Equipment Corp.
Dept. P 10 West Allis 14, Wisconsin

- SIMPLE • COMPACT MECHANISM
- A time-proven idea developed into Modern Equipment.



BLACK-MAGIC

BLACKENS & RUST-PROOFS

❖

One-Bath Process For All Steels Except Stainless

❖

Other Baths For Copper, Zinc, Brass, Cadmium

Imparts a rich, permanent black that will not rub off. Bakes at a very low temperature—300° F. Non-priority. Ordnance approved. Samples on request. Gages processed with Black-Magic (Pat. No. 2,355,007) betray wear VISUALLY. Its use saves long hours spent in guess work. Write for full details.

SILCO

NEW GLASS-BASE FINISH FOR STEEL & BRASS

A new spray finish that bakes at 350° F. Black, white and many smart colors. Resists corrosion, abrasion, mild alkalis, most acids and a high degree of heat. Fine for exhaust manifolds, stove linings and marine equipment. Tests JQD 515 QM Dept. Non-priority.

***SILCO* or *BLACK-MAGIC* samples on request.**

BLACK-MAGIC BLACKING SALTS for STEEL, IRON COPPER, ZINC CADMIUM
•
WITCH-DIP WITCH-OIL FINAL FINISHES
•
SILCO PROTECTIVE COATING
•
Cleaners
Wetting Agents
Acid Inhibitors
Heat Treating Salts
•

MITCHELL-BRADFORD
CHEMICAL COMPANY
MODERN METAL FINISHES
2446D Main St., Stratford P. O., BRIDGEPORT, CONN.

Kelite Laboratory Expands

In a move to expand its laboratory research to include a wider range of chemical processing and cleaning, Kelite Products Inc., 909 E. 6th St., Los Angeles 1, Calif., has advanced Joseph H. Hart, formerly chief chemist to laboratory director, and has increased the laboratory personnel.

Meredith H. Fairchild has been promoted to chief chemist, his former position as analytical chemist being filled by Donald W. Vance who recently joined the kelite organization.

Mr. Hart, a member of the Los Angeles section of American Chemical Society, has been with Kelite since shortly after its establishment, and previously was testing engineer with the Bureau of Standards. He has been an active leader in the application of pH control to chemical cleaning and processing.

Mr. Fairchild, who joined Kelite in 1942, is a graduate of Northwestern University. Mr. Vance received his degree from Leland Stanford University. Both men have done post graduate work at the University of Southern California.

STRIPPING COPPER?

McKEON'S

Liquid Sulphur

offers

FREE

Sample
Consultation
Equipment design
Production Engineering

HELPS YOU

Save critical materials
Decrease costs
Increase production

SULPHUR PRODUCTS CO.
GREENSBURG PA.

Sherwin-Williams Appoints Southeastern Manager

The Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland, Ohio, announces the appointment of W. B. Bell as manager of its southeastern sales district. Mr. Bell will make his headquarters at Atlanta, Georgia.

Since joining the company in 1922, Mr. Bell has occupied numerous sales positions, becoming Cincinnati division sales manager in 1933. In 1935 the Atlanta-Nashville divisions were combined under the managership of Mr. Bell. Later he became industrial sales manager for the then South Central division.

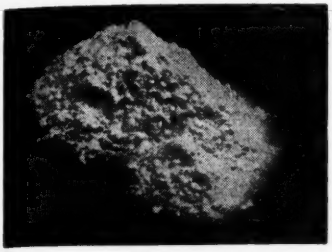
DuBois Research Laboratory Expanded

According to an announcement made by T. V. DuBois, president of The DuBois Co., Cincinnati 3, Ohio, an expansion has been made in the Research and Production Development Department of this firm. Over 600 square feet of additional floor space has been devoted to modern chemical and testing equipment for the development of highly specialized processing and cleaning compounds for the metal, rubber and plastics fabricating industries.

Pennsalt Organizes Export Department

Pennsylvania Salt Manufacturing Company, manufacturer of chemicals for metal, oil refining, ceramic, and many other industries, announces the organization of an Export Department at the company's main office at 1000 Widener Bldg., Philadelphia 7, Pa. John H. S. Barr, who has been identified with Pennsalt for 15 years in technical and sales capacities, has been appointed manager.

The formation of an Export Department is a result of the company's study over the past year of the possibilities for post-war business in all Latin-American countries, including Cuba, Haiti, Jamaica, and Puerto Rico. Mr. Barr made an extended visit to Brazil and other important Latin-American countries last year for the purpose of investigating the possibilities for future business in the heavy and specialized chemicals produced by Pennsalt.



This is FLOCK

Put it to work on your modernized products

It's amazing how many ways the many types and colors of Flock can be used—and how economically!

FUNCTIONAL

Used in airplane, auto and numerous other industries for —

SOUND DEADENING • TEMPERATURE INSULATION • INTEGRAL GASKETS • SHOCK-ABSORBING SURFACE • NON-MAR SURFACE PROTECTION.

DECORATIVE

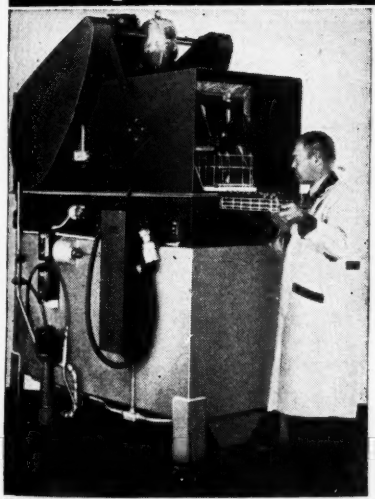
Applied in various lengths and colors to wood, paper, cloth, metal, etc., the following effects are produced —

SUEDE LEATHER • FURNITURE UPHOLSTERY FABRICS • AIRPLANE AND AUTO UPHOLSTERY FABRICS • VELVET • VELOUR • MOHAIR.

REQUEST SAMPLES AND PRICES

RAYON PROCESSING CO. OF R. I., INC. • **65 TREMONT STREET CENTRAL FALLS, R. I.**

Improved Vapor Degreasing



Speeds Up Work 1/3 Absolutely Non-Inflammable

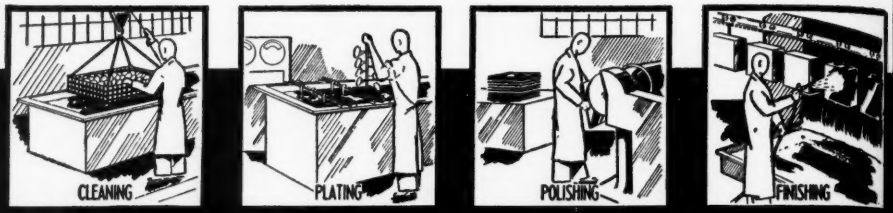
Phillips' PHILLSOLV vapor degreasing solvent is tops for efficiency. It cuts vapor degreasing time by one third! Low toxicity—higher safety factor. PHILLSOLV, non-water soluble, has many applications in instrument and war plants. No corrosive action. Write for catalog on PHILLSOLV and complete line of electrical vapor degreasing machines.

FREE DEGREASING MANUAL

Contains specific information on degreasing problems, solvents, solvent toxicity and control, solvent recovery, and many practical applications.

SEND FOR COPY TODAY.

PHILLIPS MFG. CO., 3488 W. Touhy Ave., Chicago, Ill.

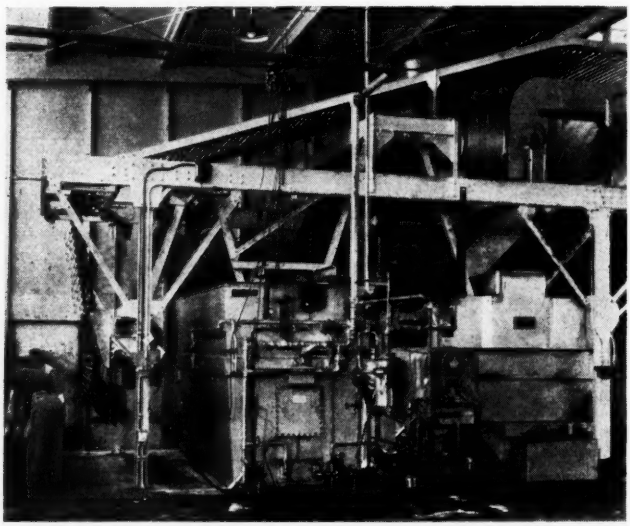


New Equipment and Materials

Industrial Oven Automatic Finishing System

The Industrial Oven Engineering Co., 11621 Detroit Ave., Cleveland, Ohio, has developed an automatic system for finishing the steel landing mat sections used in building emergency airfields. Said to be readily adaptable, without construction change, for a variety of peace-time work, the system, according to the manufacturer, provides for the finishing of landing mats at rates ranging from 400 to 600 sections (20 inches x 10 feet) per hour degreased, dip-painted, baked, cooled, and unloaded ready for shipping.

The system consists basically of a continuous cross-bar conveyor which carries the parts through the various processes; a vapor degreaser; an agitated dip tank; and a three-zone oven which dries, bakes, and cools the mats continuously. Automatic operation, including the use of mechanical loaders and unloaders, is said to cut manpower requirements to a minimum. Provision of a heavily insulated oven shell, maximum recirculation of oven atmosphere, and the use of preheated air from the cooling zone as make-up air for the heating system result in fuel savings of from 12 to 25 per cent, it is stated. In addition, the inclusion of a com-



Industrial Oven Automatic Finishing System

plete exhaust system for the paint tank is said to reduce fume hazard to operators, while the use of full explosionproof equipment (not only in the dip tank, but also throughout the system) assures safe operation at all times, it is claimed.

Custom-built to meet individual requirements the Industrial Oven Automatic Finishing System is heavly and durably built of structural steel. An unusual advantage of the system is the fact that carry-over heat from the degreasing operation is used to control the viscosity of the paint in the dip tank. The latter is completely agitated and provided with all necessary dumping, draining, pumping, and automatic fire fighting equipment.

Turco Stripper L-780

A water-soluble paint stripper that is designed to loosen paint for speedy removal with water has been developed by Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif. Known as Turco Stripper L-780, the material is said to be non-corrosive on metals, thus making it safe for us on aircraft parts or assemblies and for the removal of zinc chromate primer as well as other paint coatings. Due to the water soluble characteristics of the stripper, brushes and cleaning equipment can, it is claimed, be cleaned for reuse quickly and completely by vigorously churning in a bucket of water.

According to the manufacturer, Turco

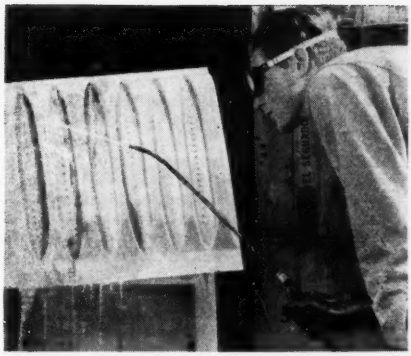
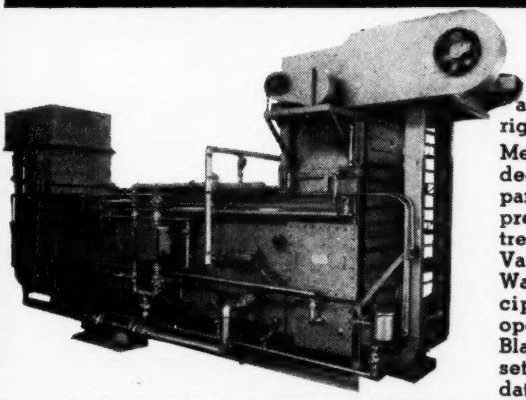


Illustration showing Turco Stripper L-780 being removed from surface by hosing with water

QUICK...ECONOMICAL...*Solvent* DEGREASING



The time is here when a thorough degreasing job must be done fast and *at low cost!* That's a Blakeslee job. It is being done right now in hundreds of plants. Metal components of all kinds–from deep drawn stampings to threaded parts—are completely cleaned and prepared for finish, assembly heat-treating, etc. Blakeslee Solvent Vapor Degreasers and Metal Parts Washers operate on simple principles which assure minimum operating expense. Let us send a Blakeslee representative to see your set-up and make our recommendations. Write for 24 page bulletin.

G. S. BLAKESLEE & CO.

Main Office and Plant: Cicero Station, Chicago 50, Illinois

New York Toronto, Ontario

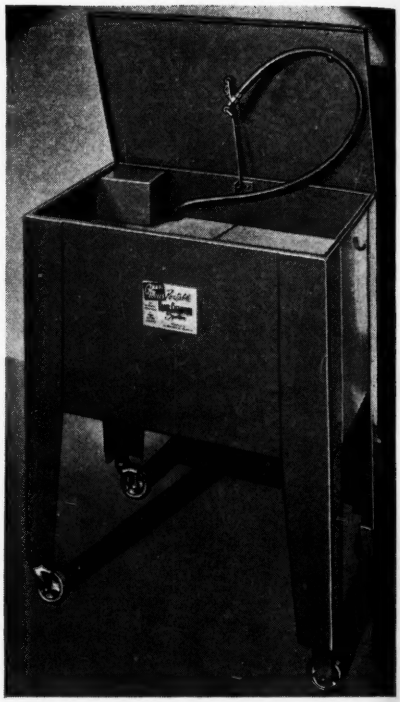
Stripper L-780 has a slow rate of evaporation, thus avoiding wasteful multiple applications and making one coating usually sufficient to complete the stripping job. Surfaces which are oily or covered with road film require no precleaning before applying the stripper, it is claimed.

Applied with brush or spray, the material is left on the surface until it tests ready for removal (five to twenty minutes). The loosened paint is then scrubbed with a water saturated brush to form a slurry which is subsequently removed by hosing with water, steam, or air and water gun. The stripper, being free rinsing, leaves a water break free surface which is said to require little treatment to prepare for further processing.

Gray-Mills Parts Cleaning System

A parts cleaning system combining the utility of two washers into one self-contained portable unit has been announced by the Gray-Mills Co., 1948 Ridge Ave., Evanston, Ill. The system includes a portable cleaner with a unique "swisher" feature and cold-cleaning Flo-Bac solvent.

Large parts requiring individual handling are cleaned of grease and grime by a strong stream of solvent pumped from a tank below. Smaller parts may be washed in quantity by merely pouring them into a basket and immersing in solvent. The two-section shelf provided may be removed, thus affording access to the dipping tank below. The dipping basket rests on a simple, hand-operated "swisher" device, which speeds the cleaning operation by providing a convenient method for agitating fluid.



Gray-Mills Parts Cleaning System

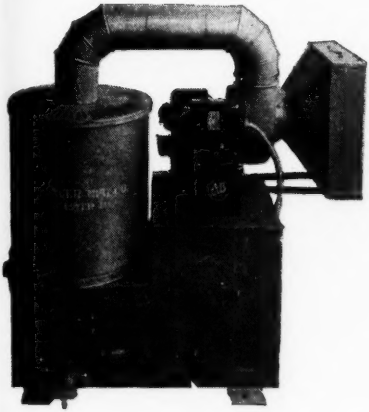
Parts such as castings, gears, bearings, carburetors, air cleaners, machine products and tools, may be quickly washed in the Gray-Mills Cleaning System. Fully portable, the unit is equipped with a built-in gear pump. A safety cover provided is said to eliminate fire

SOL-KLEAN
for
Better Paint Adhesion
INDUSTRIAL CHEMICAL PRODUCTS CO.
DETROIT 7
Milwaukee **Fort Wayne**

For a real good polishing job use
KEYSTONE EMERY
TURKISH — NAXOS — AMERICAN
KEYSTONE EMERY MILLS *Write for Sample* **4316 Paul St., Phila., Pa.**

KREIDER *Centrifugal* DRYER

Dries the average basket of small parts *in less than 35 seconds!*



The Kreider Centrifugal Dryer is a *modern* drying machine... designed for speedy production... engineered for easy operation and low operating costs.

This all-steel electric welded dryer is ruggedly constructed. It has V-belt drive, reversing drum switch, fast-acting foot brake, ¾ H.P. motor for efficient, economical operation. *Available with or without auxiliary heating unit.*

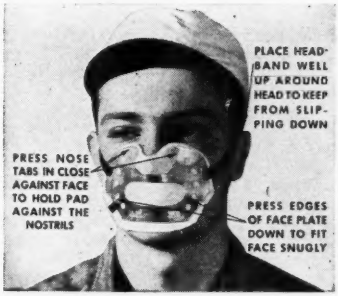
Write or wire for complete information and prices.

DELLINGER MANUFACTURING COMPANY
729 N. Prince St., Lancaster, Pa.

***Don't Breathe* DUST**

Use a MARTINDALE PROTECTIVE MASK

Weighs only 2/5 oz.


PLACE HEAD-BAND WELL UP AROUND HEAD TO KEEP FROM SLIPPING DOWN
PRESS NOSE TABS IN CLOSE AGAINST FACE TO HOLD PAD AGAINST THE NOSTRILS
PRESS EDGES OF FACE PLATE DOWN TO FIT FACE SNUGLY

These aluminum masks are so light and so comfortable to wear that there is no excuse for anyone breathing dust or dirt.

They are effective against all dusts except toxic dusts and asbestos or free silica. Used extensively for paints and enamels that do not contain dangerous pigments or thinner.

Filter pads or refills can be changed in five seconds.

Send for a Special Trial Kit containing 2 Masks and 50 Refills.
Price, postpaid **$1.25**

(Ohio customers add 4c Sales Tax.)

Complete information in Mask Bulletin No. 348.

Martindale Electric Co.
1367 HIRD AVE. CLEVELAND 7, OHIO

hazards. The Flo-Bac solvent is used cold and is said to degrease parts without pitting or corroding. Continuously filtered, the solvent may be used over again.

The Gray-Mills Parts Cleaning System is available in two models; namely, a large model designated as the P70 and a smaller model designated as the P60.

Fostoria Model P-7-IR Portable Infra-Red Unit

To meet the need for portable radiant energy equipment to facilitate baking, drying, and preheating operations, The Fostoria Pressed Steel Corp., Fostoria, Ohio, has placed on the market the Model P-7-IR Portable Infra-Red Unit shown in the accompanying illustration. Designed for use in singular or multiple assemblies, the unit features an adjustable cross arm and reflector yoke, thus permitting the radiant energy to be directed at various angles from a height of 1½ to 6 feet.

The Fostoria Model P-7-IR Portable Infra-Red Unit is said to be particularly useful for drying out electrical equipment, drying off materials after degreasing, baking insulation on electric motor parts, baking finishes on a variety of products, preheating materials to facilitate assembly, preheating thermoplastics to facilitate shearing, and other operations.

Fostoria Model J-7-IR Portable Infra-Red

Promat Super-R Copper Process

Promat Division, Poor & Co., 851 S. Market St., Waukegan, Ill., announces a

FULL PROTECTION — LIGHT WEIGHT

NU-LITE

PLASTIC SLEEVES, GLOVES WORK APRONS

Provide full protection to workers from troublesome dermatitis induced by industrial irritants. Only 1/7th the weight of conventional protection garments — makes for wearer's comfort and freedom of movement—reducing fatigue.

NU-LITE sheds and resists water, oil, gasoline, strong acids, alkalis, degreasing and plating solutions.

Let us show you how NU-LITE's low cost protection features can boost production in your shop. Write for prices and samples.

PLASTIC DEVELOPMENT CONSULTANTS

NU-LITE MANUFACTURING CO.

DEPT. PF VERONA, N. J.

WE RECOVER YOUR

SOLVENTS and THINNERS

from Sludge, Waste, Wash, Spoiled Lacquers, etc.

AND SAVE YOU MONEY

Each shipment—one drum or a carload—receives PROPER and SEPARATE TREATMENT.

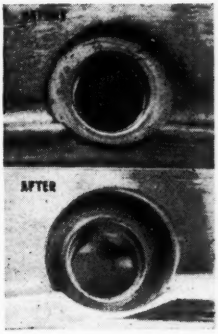
Solvents recovered by the Lofgren Process.

Write to:

SOLVENTS RECOVERY SERVICE, Inc.
1019 Broad St. or Newark, N. J.

HAMMOND CHEMICAL SERVICE, Inc.
241 Brunswick St. Hammond, Ind.

BRUSH YOUR BURRS AWAY

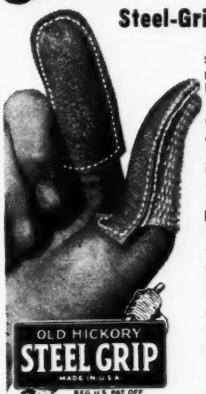


Roberts Burring Compound provides better and faster production. NOTE the absence of any excess metal, the smooth finish and rounded corners after brushing shown in lower illustration at right.

Write for samples and suggestions.

ROBERTS ROUGE CO.
STRATFORD • CONN.

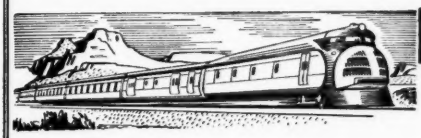
Save Fingers with Steel-Grip Finger Guards



Famous Industrial Safeguards Since 1910

Hundreds of factories are saving time and injuries in war production by protecting workers with Steel-Grip Finger Guards. Used for handling rough or sharp articles, for buffing, grinding, sanding, polishing, punch press work and hundreds of other jobs. Protect fingers or thumb, front or back, from cuts, abrasions or blisters. Made of durable leather with elastic web back for snug, cool, comfortable fit. Easy on and off. One size fits all, men or women. Send 10c each for samples or trial order box of 50 at 8½c each, less 10%. *Catalog of Steel-Grip Safety Apparel free on request.*

INDUSTRIAL GLOVES CO.
746 GARFIELD BLVD. DANVILLE, ILL.
Canada: Safety Supply Co., Toronto



SPEED UP

FILTERING of Plating Solutions by using the SPARKLER *"Horizontal Plate"* METHOD

Sparkler Filters not only provide the fastest medium for filtering of solutions, and facilitate handling through their mobility, but are also the most flexible, efficient and economical ever devised for uniform, dependable filtration.

Designed to use any filter aid—and *less* of it—Sparkler Filters operate at unbelievably low cost at higher flow rates. Longer filtering cycles materially reduce the frequency of cleaning.

FREE FILTRATION ENGINEERING SERVICE
Write for name of nearest Sparkler representative—no obligation.

SPARKLER MFG. COMPANY
255 Lake St.
Mundelein, Ill.

SPARKLER FILTERS HORIZONTAL PLATE

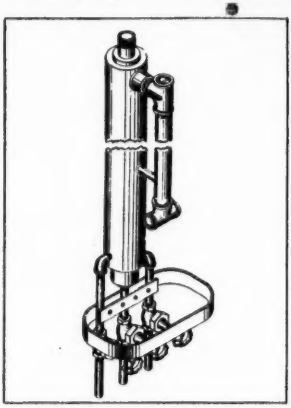
process whereby copper can be deposited at greatly accelerated rates in still tanks, semi-automatic or fully automatic machines. Designated as the Super-R, the process provides for the production of extremely uniform, ductile deposits which can be easily buffed to a high brilliance.

Super-R copper is furnished in the form of prepared concentrated electrolytes. Existing Rochelle type electrolytes, however, may be converted for use. The power is provided by a Promat kicker which supplies alternating current for super-imposition upon direct current furnished by a generator or rectifier.

The Super-R is a very flexible, easily controlled, high speed method of plating copper in Rochelle type baths without the usual operating difficulties, it is claimed.

Inco Air-Strainer Water Trap

Designed to remove a high percentage of water condensate, oil or dirt and to provide clean, dry air to equipment, the



Inco Air-Strainer Water Trap

Inco Air-Strainer Water Trap shown herewith is now being being offered by the Inco Engineering Company, 200-12 3rd St., N. E., Cedar Rapids, Iowa. The unit operates on principle of high velocity impingement on cold surface in three stages to remove moisture and oil.

ALLWOOD

"Vienna Brand" Line

Made from Limestone that is identical in chemical analysis and geological structure with European Imported Lime. Tests show a "lime cake" made from Allwood "Vienna Brand" Lime equals the finish made from imported lime.

WRITE FOR FULL PARTICULARS

ALLWOOD LIME COMPANY

Manitowoc • Wisconsin

SOLVE YOUR SPEED-UP PROBLEM WITH A

Write today for full data on how you can adopt the LUPOMATIC DEBURRMASTER equipment for deburring parts for the duration and for post-war plans, saving 85% of your finishing cost.

LUPOMATIC TUMBLING MACHINE CO., INC.

4510 BULLARD AVE. BRONX, N. Y.

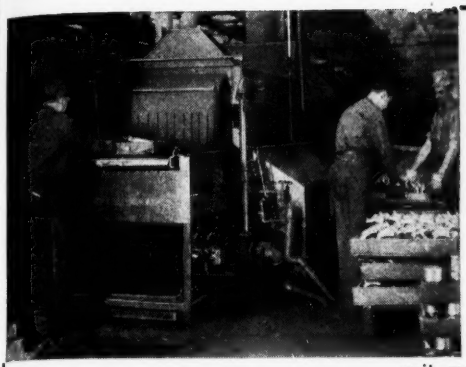
Packer-Matic

AUTOMATIC POLISHING BUFFING & DE-BURRING MACHINES

ALL TYPES AND SPECIAL.

Send Samples for Estimate.

THE PACKER MACHINE CO., Meriden, Conn.



Quick, Efficient Cleaning of Miscellaneous Parts in our Tunnel Type Machine

(Work baskets return by gravity conveyor)

This Tunnel Type is proving an unexcelled machine for general utility and washing and drying a multiform variety of metal parts.

We make all types of Washing Machines, large or small, to suit your particular product and plant requirements such as:

FLAT OR OVERHEAD CONVEYOR TYPE OR REVOLVING DRUM WASHING MACHINES • COLD AND HOT BLAST DRYING MACHINES • QUENCHING MACHINES • PICKLING MACHINES.

Our engineering department can be of valued service to you in solving metal cleaning problems that frequently arise. Write or 'phone us. No obligation involved in an interview.

METALWASH
MACHINERY COMPANY
149-155 Shaw Ave. Irvington 11, N. J.

Coat Turntables With Cellusuede Flock

For high acoustical value, for a rich velvety finish at low cost, for ease and economy in application—you'll find Cellusuede Flock the ideal material for coating the turntables on phonographs. And this is only one of the thousand ways to use this versatile material! Cellusuede can be applied to almost any surface and comes in a wide range of eye-catching colors. Available for immediate shipment.

Cellusuede
FLOCK

CP
Cellusuede Products, Inc.
ROCKFORD, ILLINOIS

Easily installed in any pipe line, the Inco Air-Strainer Water Trap is of all-steel electric welded construction and includes outlet connections to serve four pieces of air equipment. According to the manufacturer, the unit offers practically no resistance to air flow and has large air volume capacity, thus assuring even flow at outlet. Water exhaust valves are provided for occasionally releasing trapped water.

Specifications of the Inco Air-Strainer Water Trap are as follows: maximum working pressure, 125 lb.; inlet size, 1-inch standard pipe; overall height, 46-¾ inches; weight complete, 55 pounds.

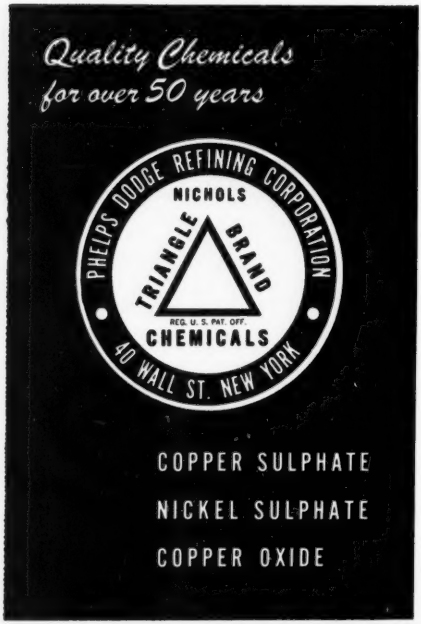
Presto Polishing Wheel Bushing

Quick and easy changing of wheels without wear to spindle and without risk to operator are advantages claimed for the Presto Polishing Wheel Bushing now being introduced by The Manderscheid Co., 605 W. Washington Blvd., Chicago 6, Illinois.

Presto Polishing Wheel Bushing

When equipped with this bushing, polishing wheel can be easily changed without running the spindle. The wheel is said to remain concentric regardless of how often removed, thereby assuring uniform contact of wheel around the bushing for fast polishing of work without waste of grain.

Made of steel, the Presto Bushing can be easily pressed into the wheel using a polishing lathe spindle. Notches hold the bushing in the wheel and prevent turning.



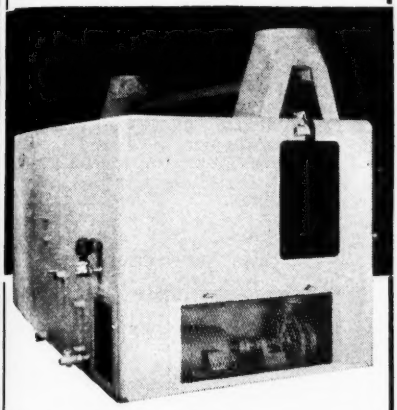
Allwood "Vienna Brand" Lime

Lime which is said to be identical in chemical analysis and geographic structure with European imported lime, to be known at Allwood "Vienna Brand" Lime, is now being produced by the Allwood Lime Co., 901-A York St., Manitowoc, Wis. An outstanding

Adaptable

to ALL PARTS

that can be handled on a Monorail Conveyor



This newly-designed Howard Monorail Wash and Compressed Air Blow-Off Machine is built to handle a wide variety of parts on a mass-production basis. This machine operates with equal efficiency in the cleaning and drying of shells, rockets, bombs or parts having peacetime applications. The compressed air blow-off permits unusual economy and efficiency in the drying of parts. A special feature is the easy access to the interior for inspection and cleaning. Complete details will be gladly furnished.

SEND FOR CATALOG OF OTHER HOWARD CLEANING AND FINISHING MACHINES

HOWARD *Engineering & Mfg. Co.*

1056 HULBERT CINCINNATI 14, OHIO

Banish irritating nauseating paint odors, and painters will work better, paint jobs will get done quicker. Ridsmel kills paint smells in split seconds! Not after — but *before* application! A few economical drops do the trick. Safe, effective in any paint, varnish, enamel. Ridsmel is used in industrial plants, hospitals, hotels, homes everywhere.

Send For Trial Bottle, $5 Prepaid

(Good for 200 Gallons of Paint)

Holley Chemical Co.
126 E. 25th St.
New York 10, N. Y.

COMMENDED PARENTS' MAGAZINE CONSUMER SERVICE

feature claimed for the lime is its resistance to deterioration when exposed.

Allwood Vienna Brand Lime is supplied packed in airtight moistureproof carriers to ensure high quality at the moment of opening.

Unichrome Alkaline Stripping Bath

Designed to eliminate the need for critical chemicals in metal stripping, an alkaline stripping bath for removing copper, chromium, cadmium, zinc, tin, and other electrodeposited metals from steel and cast iron is announced by United Chrominum, Inc., 51 E. 42nd St., New York 17, N. Y. With this bath, the base metal is not etched or pitted, it is claimed. Hence, stripped parts may be used as they come from the bath. If replating is desired, no mechanical refinishing is said to be required, with consequent savings in labor, grinding and buffing materials.

Simple preparation is an outstanding feature of the Unichrome Alkaline Stripping Bath. It is made up by dissolving 2 lb. of Unichrome strip salt in water and adjusting the pH. The stripping operation is then ready to be performed. Moderate operating temperatures from 80 to 180 deg. F. are employed, thus minimizing heat loss. Current densities range from 100 to 175 amperes per square foot.

Recommended equipment is simple, consisting of an unlined steel tank with a plain steel heating coil, together with facilities for rinsing. Ordinary steel or copper electrodes are used, depending upon the metal to be stripped. Racks most suitable for plating a given piece of work are said to be suitable for stripping it with this bath.

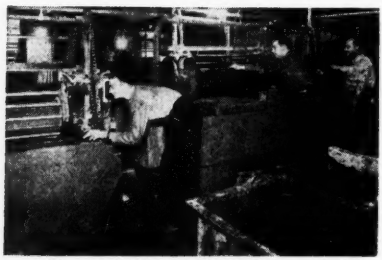
An outstanding advantage is the nontoxic, non-corrosive nature of the solution which, it is claimed, does not attack clothing or equipment and gives off no objectionable or injurious fumes during operation. Ventilation is not required except where high amperages are used, it is stated. Since the solution is only mildly alkaline and operating temperatures are low, it is said to have a minimum of affect on rack coatings and stop-off materials.

DuBois "Terj" and "Klarifiant"

A lime-dissolving compound for use in spray washers, to be known as "Terj," has been placed on the market by The DuBois Co., Cincinnati 3, Ohio. The compound is designed to prevent the formation of scale in spray nozzles and orifices and to minimize foam formation in wash tanks.

Introduction of a water wash compound for water curtain spray booths is also announced by the company. Known as "Klarifiant," this compound is said to keep hydraulic systems free of scale and sludge and prevent "water breaks."

EDMONT
INDUSTRIAL GLOVES
Acid-Caustic-Oil **PROOF** for **MEN and WOMEN**
Synthetic Rubber Coating. Fabric Reinforced Lining
EDMONT MFG. CO.
509 Orange St., Coshocton, O.



PERMAG COMPOUNDS are used by prominent electroplating concerns throughout the U. S.

Speed and Efficiency in Metal Cleaning with the PERMAG Process

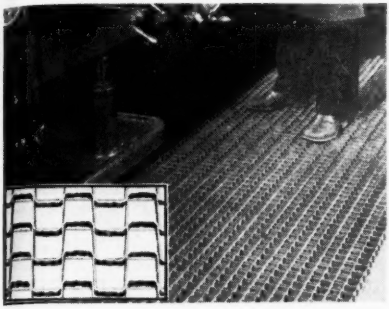
PERMAG COMPOUNDS used as directed produce a chemically clean surface in the quickest possible time. Surfaces of aluminum and other soft metals are uninjured by cleaning with PERMAG COMPOUNDS.

If you have a cleaning problem, write us.
Our Cooperative Service will be glad to aid you.

MAGNUSON PRODUCTS CORPORATION
Main Office: 50 Court St., Brooklyn, N. Y.
In Canada: Canadian Permag Products, Ltd., Montreal - - - - Toronto

Klemp Improved Safety Steel Mat

An improved safety steel mat which is said to provide maximum non-skid protection is now being manufactured



Klemp Improved Safety Steel Mat

by Wm. F. Klemp Co., 6641 S. Melvina Ave., Chicago 38, Ill. A feature of the mat is a slight crimp or center bend in one side of the strong steel mesh.

The mat, which can be rolled up like a rug and placed in any location desired, is said to be particularly useful around machines and other equipment to prevent slipping, keep feet dry, and so on. Made of steel, the mat is non-absorbent and can be easily cleaned with hot water or cleaning solution.

The Klemp Improved Safety Steel Mat is available in any length up to 25 feet and any width up to 6 feet. By joining several mats, any desired amount of space can be covered.

B. F. Goodrich Industrial Rubber Products. A 12-page booklet on its industrial rubber products has been prepared by The B. F. Goodrich Co., 490 S. Main St., Akron, Ohio. Included in the booklet are illustrations and descriptions of Goodrich Vibro-Insulators, devices of rubber and metal which are designed to reduce vibration; molded, extruded, lathe cut and sponge rubber products; rubber lined tanks and valves; products made with Koroseal, a flexible material created from plasticized polyvinyl chloride; V-belts, and cements. Copy free upon request.

74

BURRING COMPOUND

DE-BURRING ALL METALS WITH FELT-CLOTH OR TAMPICO WHEELS

THE BUCKINGHAM PRODUCTS CO.

8900 HUBBELL AVENUE

DETROIT 27 MICHIGAN

SAMPLES MAILED ON REQUEST

Opportunity Section

INDUSTRIAL FINISHES SALESMAN WANTED

For New York and surrounding territory. Wanted by an old established Eastern manufacturer of lacquers, enamels, synthetics. Submit full qualifications and information when replying. Write Box No. 101, Products Finishing, 431 Main St., Cincinnati 2, Ohio.

WANTED

1 Lacquer Dipping Machine Conveyor. Oven Type. Moderate Heat.

GREAT METAL MANUFACTURING CORP.

9 Wyckoff Avenue **Brooklyn, New York**

MANUFACTURERS' AGENTS WANTED

A line of good metal solvent degreasers, cleaners and rust preventatives needs additional sales representation.

Protected territories are available to manufacturers' agents, who have a following in the metal fabrication and industrial trades.

Reply Box No. 102, Products Finishing, 431 Main St., Cincinnati 2, Ohio.

PLATER WANTED

To do silver plating and refinishing. Absolutely permanent job for competent man. State salary and experience.

MEYER JEWELRY CO.

Professional Building

KANSAS CITY 6, MISSOURI

"The Case of the Flying Horse Collar" is the title of a mailing piece now being distributed by Roxalin Flexible Finishes, Inc., Elizabeth, N. J., describing a specially developed plastic base protective coating for use on hard-to-finish metals, known as "Paladin," and its application to aircraft ignition harness manifolds. Copy free upon request.

Birdseye Infra-Red Brochure. The Wabash Appliance Corporation, manufacturer of Birdseye infra-red radiant heat lamps, has prepared a special profusely illustrated brochure on the near infra-red process. Copy of brochure is available free to interested individuals addressing requests to the Wabash Appliance Corp., 345 Carroll St., Brooklyn 31, New York.

Oakite Special Service Report. Oakite Products, Inc., 20 Thames St., New York 6. N. Y., now has available a six-page report on specialized surface preparation methods for ferrous parts which are to be bright zinc plated. The report includes information on the use of Oakite degreasing and cleaning materials for quickly removing grease, machine oils, drawing lubricants, stamping compounds, and other deposits from parts requiring bright zinc plating. Copy free upon request.

Kelite Anodizing and Cadmium Plating Bulletins. Revised editions of two familiar Kelite bulletins—Bulletin No. 8—"Anodizing," and Bulletin No. 9—"Cadmium Plating"—are announced by Kelite Products, Inc., 909 E. 60th St., Los Angeles 1, Calif. Each bulletin outlines the practice and technique of the operations involved, describes the specialized Kelite materials prepared for these operations, and reprints the appropriate Army and Navy specifications.

The latest edition of Kelite Bulletin No. 1—a brief discussion of pH control in processing and cleaning—is also bound in the same covers as each of the other bulletins.

Copies of Kelite Bulletins No. 8 and 9 are available free to executives addressing requests on their company letterheads.

"Kron" Scale Catalog. A complete and factual catalog of "Kron" Scales made by Yale has been prepared for the use of buyers who are interested in investigating the advantages of scales used as an integral part of a materials handling program. The catalog fully covers the entire Kron Scale line which includes dormant and portable platform types of special counting, batching, tensile strength, and dynamometer scales. Complete specifications and dimensions of every standard Kron scale are given.

A copy of Catalog R-44 is available free to executives addressing requests to The Yale and Towne Mfg. Co., Philadelphia Division, 4530 Tacony St., Philadelphia 2, Pennsylvania.

Hercules Nitrocellulose. A 56-page booklet regarding the properties and uses of soluble nitrocellulose—base for plastics, lacquers, coated textiles, and many other products—has been published by the Cellulose Products Department of Hercules Powder Co., 927 Market St., Wilmington 99, Del. Divided into two parts (the properties of nitrocellulose and its uses), this technical booklet is intended to be an aid to manufacturers already using nitrocellulose as well as those who may find in this product an answer to their problems.

Beginning with a discussion of the history of nitrocellulose, the booklet, in its first section, includes chapters on the manufacture, types, solubility, viscosity, and other properties of nitrocellulose. The first section also contains six tables, including one showing nitrogen and viscosity specifications of the 17 Hercules soluble nitrocellulose types, a nitrocellulose blending chart, and 22 other charts and graphs.

The second section of the catalog discusses the use of nitrocellulose in lacquers, coated textiles, plastics, adhesives, and inks. Nine tables in this section indicate the hardness of lacquer films, the results obtained from exposing lacquer panels to three and six months of weathering in Florida; and the results obtained from exposing pigmented nitrocellulose lacquer panels to three years' weathering in Wilmington, Delaware. The use of nitrocellulose in artificial leather and coated textiles and typical properties of nitrocellulose plastics are also treated.

Copy of booklet is available free to executives addressing requests on their company letterheads.

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METAL FINISHING SERVICE

Long experience in the field qualifies us to give proven advice on the selection and use of electroplating and polishing equipment as-well-as related supplies. You can depend upon our stock facilities — with few exceptions — for prompt shipments.

WHEN YOU NEED:

Buffs *Tripoli* *Cleaners* *Rouge* *Nickel Salts*
Brushes *Glue* *Emery Paste* *Cyanide* *Copper Salts*
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Complete motor generator sets, tanks, plating barrels, Anodes, polishing lathes and wheels all other items used in connection with metal finishing—Phone CAnal 6-3956-7.

BEAM KNODEL COMPANY

Metropolitan Distributors for
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195 Lafayette Street
NEW YORK CITY, N. Y.

The Finishing Touch **By J. A. Patterson**

"It's Sam's uppers — he wants you should dip 'em in there and make 'em all gold."